N00217_000230
NS HUNTERS POINT, CA
SSIC 5000-33c

SCOPING DOCUMENT, REMEDIAL INVESTIGATIONS/FEASIBILITY STUDIES, VOLUME 1 OF 2

03/03/1988

HARDING LAWSON ASSOCIATES

March 3, 1988

SCOPING DOCUMENT
REMEDIAL INVESTIGATIONS/ FEASIBILITY STUDIES
NAVAL STATION, TREASURE ISLAND, HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0727

12ND WESTDIV 5000/1 (7-72)

A Report Prepared for

Western Division,
Naval Facilities Engineering Command
900 Commodore Drive
San Bruno, California

SCOPING DOCUMENT
REMEDIAL INVESTIGATIONS/
FEASIBILITY STUDIES
NAVAL STATION, TREASURE ISLAND,
HUNTERS POINT ANNEX
SAN FRANCISCO, CALIFORNIA

HLA Job No. 2176,121.02

Volume I

by

Stephen M. Farley
Stephen M. Farley
Senior Geologist

Lisa S. Teague
Lisa S. Teague
Geologist - 3839

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California 94948
415/892-0821

March 3, 1988

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF ILLUSTRATIONS

1.0 INTRODUCTION

Under the direction of the U.S. Navy, Western Division, Naval Facilities Engineering Command (The Navy), Harding Lawson Associates (HLA) has prepared this Scoping Document for conducting studies at the Naval Station, Treasure Island, Hunters Point Annex (HPA), located in the southeastern part of San Francisco (Plate 1). This document was prepared to respond to requirements of the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 [*Environmental Protection Agency (EPA), 1980*], the Superfund Amendments and Reauthorization Act (SARA) of 1986 (*Public Law 99-499, 1986*), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) of 1985 (*EPA, 1985a*). It is also intended to respond to state hazardous waste control laws presented in the California Administrative Code and the Porter-Cologne Water Quality Control Act (California Water Code).

In accordance with the above laws and regulations, remedial investigations/feasibility studies (RI/FSs) are to be conducted at some locations at HPA. The objectives of the RI/FSs are:

- To determine the nature and full extent of contamination in air, soil, surface water, and ground water
- To evaluate existing and potential migration pathways
- To evaluate existing or potential threat to human health and/or the environment
- To identify and evaluate appropriate remedial actions to address the identified sites
- To collect and evaluate the data needed to formulate and prepare a Remedial Action Plan (RAP) in accordance with state and federal regulations.

To facilitate the RI/FS process, this Scoping Document has been prepared. The main purposes of this document are:

- To summarize the previous activities and investigations that have been conducted at HPA
- To describe the numerous ongoing or planned investigation at HPA, their interrelationships, and their relationship to the RI/FS process for HPA
- To describe the Navy's approach to investigating and remediating the sites at HPA
- To describe and briefly outline the field investigations that may be performed at the sites to be addressed in the RIs
- To describe the additional tasks currently planned (i.e., public health and environmental evaluation, initial screening of remedial technologies, and community relations).

This Scoping Document was developed using available data. Data developed during the scoping process were sometimes not incorporated because of time constraints, that is, the need to submit this document for agency review. In addition, there have been several recent changes in guidance from the EPA and in their interpretation of the requirements for federal facilities. This document presents the Navy's current strategy for investigating HPA.

1.1 The Navy's Integrated Studies

Hunters Point has operated as a shipyard or ship repair facility almost continuously since 1869. Private industry owned or leased the property until 1941 when the Navy took possession. The Navy operated the shipyard until 1974, and in 1976, leased it to Triple A Machine Shop (Triple A). Triple A operated the ship repair facility and subleased numerous buildings to other private commercial and light industrial firms. Historical operation of the facility generated a wide variety of solid and liquid wastes over many decades. These wastes were disposed in accordance with practices acceptable at the time, with the exception of recent alleged illegal disposal operations conducted by Triple A. Those sites containing or potentially containing hazardous materials are shown on the Site Plan, Plate 2.

To address the problem of hazardous wastes at naval facilities, the Navy Assessment and Control of Installation Pollutants (NACIP) program was developed to identify, characterize, and remediate sites contaminated by those hazardous materials that pose a threat to human health and the environment. The Navy recently modified the NACIP program, now called the Installation Restoration (IR) program, to more closely coincide with NCP, CERCLA, and SARA requirements and EPA procedures. For each installation, funding for the IR program is independent of normal facility operation or construction funds.

The Navy conducted the first two NACIP (IR) studies, the Initial Assessment Study and the Verification Step, described in Section 2.0, that identified ten sites (hereafter referred to as NACIP sites) requiring further investigation. An eleventh site, a PCB-spill area at Building 503 was identified later. The Navy will conduct RI/FSs on these sites in accordance with applicable state and federal laws and regulations. A schematic drawing of the RI/FS process through which the sites will proceed is presented on Plate 3. The Navy plans to attempt completion of the RI/FS process by the end of 1988.

Concurrent with some of the NACIP studies, the San Francisco District Attorney's (DA) office has been investigating allegations that Triple A illegally disposed hazardous wastes at about 20 locations throughout HPA (*DA, 1987*). These locations, referred to as the Triple A sites, are the subject of further investigations by both the DA's office and the Navy. Ten of the Triple A sites coincide with or are encompassed by five of the NACIP sites while the other Triple A sites are separate.

To provide clarity during the RI/FS process, the NACIP and Triple A sites have been combined, where appropriate, and renumbered as Installation Restoration (IR) or Preliminary Assessment (PA) sites (Table 1); their locations are shown on Plate 2. Sites IR-1 through IR-11 include the ten NACIP sites and the Building 503 PCB-spill site, and incorporate those Triple A sites that fall within their boundaries. Sites PA-12 through PA-18 represent single or multiple Triple A sites. The types of wastes stored, disposed, and/or released at the IR sites are noted Table 2 and both types of sites are described in later sections.

The Navy will conduct RI/FSs at Sites IR-1 through IR-11. In addition, if the preliminary assessments/site inspections (PA/SIs) being conducted detect contaminants that may pose a threat to human health or the environment at Sites PA-12 through PA-18, then these sites will be included in the RI/FS process and will be renumbered as IR sites. If the results of the PA/SIs indicate that a threat to human health or the environment is not present, supporting documentation will be provided to the regulatory agencies, and if they concur, those PA sites will not be studied further.

Several other studies have been or are being conducted by the Navy, somewhat concurrent with those discussed above, to evaluate whether other areas at HPA pose a threat to human health or the environment. These studies are discussed in greater detail in Section 2.0, but are summarized below so that the Navy's approach to addressing HPA can be presented:

1. Area A and Area B Studies - Plate 2 shows the coverage of the Area A and B studies where shallow test borings were drilled on 200-foot and 400-foot grids, respectively. Soil samples were collected and analyzed and a report prepared (*EMCON, 1987b*). Additional details on this study are presented in Section 2.4.2.

2. Underground Storage Tanks - The Navy has contracted another consulting firm to investigate underground storage tanks at HPA. If a tank is found to be leaking, the area will be investigated to determine the extent of contamination. Those tanks that have leaked and created small problems (i.e., limited extent) will be removed and the sites remediated in accordance with appropriate local and state regulations. Those tanks that have leaked and created significant problems will be designated as IR sites and HLA will be tasked to perform an RI/FS on them.

3. Bay Sediments - Several studies have been conducted on bay sediments in conjunction with proposed maintenance dredging. The Navy will continue to study the bay sediments as they relate to future maintenance dredging plans.

4. MILCON Sites and Housing Areas - Under a military construction (MILCON) program and a housing development program, which are explained in greater detail in Sections 2.7.1, 2.7.2, and 2.7.3, the Navy plans to construct support facilities for Navy vessels. For each future construction site, the Navy will task HLA to prepare a site study. The purposes of this study will be to

    a. Assess the proposed site for levels of chemicals that could preclude construction.

    b. Evaluate the site for localized chemicals that may be mitigated prior to, or during, construction.

    c. Assess the potential impact of construction on potential remedial studies/actions at other adjacent sites.

    d. Assess the potential health impacts of chemicals, if present, to the construction workers.

    e. Assess the potential health impacts of chemicals, if present, to the occupants of the facility.

5. Surface Inventory - An inventory to locate, identify, and quantify possible hazardous materials will be conducted at both Navy and leased property at HPA.

6. Uninvestigated Areas - The uninvestigated areas include the remaining area of the shipyard not covered by one of the above studies (see Other Areas, Section 3.2.13). As described below and in Section 3.2.1.3, the Navy will evaluate all areas other than the IR and PA sites to determine if some level of additional field work is needed.

The Navy has begun development of specific field investigations for the RI/FSs for Sites IR-1 through IR-11. PA/SIs will be performed for Sites PA-12 through

PA-18. A phased approach has been developed for areas other than the IR and PA sites (Other Areas). Initially the Navy will conduct the equivalent of a PA for these Other Areas which will involve evaluation of additional data and information (in addition to that presented in this Scoping Document). This evaluation may show that some areas at HPA need not be investigated further, while the remaining areas may need some level of field work to be performed. As a result, sites may be added to the list of IR sites for which a RI/FS will be performed. This approach for the Other Areas is described in more detail in Section 3.2.13. Presently, because of data being obtained currently or to be collected, it is impossible to know or predict how many or when new sites will be added. Therefore, it is not known when the RI/FS process will begin for those sites that might be added. It is anticipated that RI/FSs for groups of IR sites will be performed at varying rates depending upon size and complexity and that the regulatory agencies will receive RI/FS reports as investigations are completed for specific IR sites or groups of sites.

Because of the complexity of HPA and the different chemicals that might be expected at each IR site, the Navy intends to investigate HPA on a site-by-site basis. As previously mentioned, individual sites will be combined into groups to facilitate the reporting requirements. Formulation of these groups is based on evaluation of potential threats to human health and/or the environment, and on ease of investigation/remediation. The 11 IR sites currently included in the RI/FS process have been tentatively assigned to the following groups:

<u>Group I</u>

IR-1 Industrial Landfill and Triple A Sites 1 and 16
IR-2 Bay Fill Area and Triple A Sites 2, 13, 14, 17, 18, and 19
IR-3 Oil Reclamation Ponds and Triple A Site 17

Group II

IR-6 Tank Farm
IR-8 Building 503 PCB Spill Area
IR-9 Pickling and Plate Yard
IR-10 Battery and Electroplating Shop
IR-11 Building 521 Power Plant

Group III

IR-4 Scrap Yard and Triple A Site 3 North of Spear Avenue
IR-5 Old Transformer Storage Yard

Group IV

IR-7 Sub-Base Area

This group approach is a working model and is meant to be flexible. Data obtained prior to or during the RI or other investigations may lead to different or additional IR groups.

As mentioned above, the Navy plans to complete the RI/FS process for the IR-1 through IR-11 sites by the end of 1988. An attempt will be made to collect sufficient information in the initial site-by-site field investigations, outlined in Section 3.0 of this Scoping Document, to sufficiently characterize the sites to the extent that remedial actions can be selected. Should additional site characterization information be required to support remedial action(s) selection for specific sites, such information will be collected as the FS progresses.

1.2 Regulatory Agency Coordination

The RI/FS processes are being conducted under applicable federal and state regulations as implemented by the EPA (Region IX), the California Department of Health Services, North Coast Section (DHS), and the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). The Navy understands that: 1) the agencies would cooperate with the Navy, HLA, and each other to the maximum extent possible; 2) the documents prepared during the RI/FS studies described in this Scoping Document would be sufficient for each agency's review, thus eliminating the need to prepare separate reports for each agency; and 3) all three major agencies would submit their comments on this Scoping Document and subsequent documents to the DHS, which would take the initiative to try to resolve any conflicts in the agency comments.

1.3 Scoping Document Overview

This Scoping Document includes descriptions of the shipyard, past activities and waste characteristics, previous studies, and ongoing remediation activities. Provided for each site to be investigated are a discussion of what is currently known about the site, an estimate of the extent of the proposed field investigation, and a description of the proposed analytical program. Also described are 1) the Public Health and Environmental Evaluation (PHEE); 2) the Feasibility Study, including the first task, initial screening of remedial technologies; and 3) the Community Relations Program. The final sections of the Scoping Document describe project organization, discuss the responsibilities of HLA's professional team, and present a preliminary schedule for implementing the items described in this Scoping Document.

2.0 BACKGROUND

2.1 Site Description

HPA is in southeastern San Francisco at the tip of a peninsula that extends eastward into San Francisco Bay (Plate 1). The Navy property encompasses 965 acres; of these, 522 acres comprise the on-land facilities, the remaining area is a portion of San Francisco Bay. The facility is bounded on three sides by San Francisco Bay and on the fourth by the Hunters Point district of San Francisco, which consists of public and private residential housing and commercial/industrial buildings.

The northern and eastern shores of HPA are developed for ship repair and equipped with drydock and berthing facilities. No shipping facilities are present along the southern shóre, which consists primarily of emplaced fill.

As shown on Plate 4, approximately 70 to 80 percent of the lands within HPA are relatively level lowlands constructed by placing fill along the bay margin. The remaining area is a moderately sloping ridge in the northwestern portion of the site. Elevations across the site (in feet above Mean Sea Level, MSL) range from about 6 to 10 feet in the lowlands to about 176 feet on the ridgecrest. Substantial cut and fill grading of the ridge occurred in the past to generate material for filling the lowland areas and constructing building pads.

Surface drainage appears to be primarily unconcentrated sheet-flow runoff, which is collected by on-site storm sewer systems and discharged into San Francisco Bay through a system of outfalls. Extensive grading and construction at HPA filled or modified any preexisting drainage channels; no naturally occurring, channelized drainage crosses the facility.

2.2 Subsurface Conditions

2.2.1 Geology

The oldest unit at HPA is bedrock of the Franciscan Complex. This unit is overlain in some of the upland areas by slope and ravine-fill deposits. In the low-lying areas, the Franciscan Complex is blanketed by undifferentiated sedimentary deposits consisting of consolidated sands and clays, which are in turn overlain by estuarine deposits of clay, silt, sand, and peat, termed bay mud. Artificial fill has been placed over the bedrock and/or the bay mud in most of the flat, low-lying areas of HPA.

The surficial geology of the site is depicted on Plate 4. The geologic logs of numerous borings and wells installed at HPA have aided in developing an understanding of the subsurface stratigraphy of the site. The locations of the borings, wells, and cross sections are shown on Plate 5. Geologic Cross Sections A-A' through D-D' (Plates 6 through 9) depict the stratigraphic relationships at HPA.

The Franciscan Complex bedrock is a tectonic assemblage of igneous and sedimentary rock that accumulated at the western margin of North America between 50 and 150 million years ago. Franciscan rocks have been extensively deformed during their long geologic history, giving rise to a chaotic assemblage of variably sized blocks of sandstone, greenstone, shale, chert, and serpentinite, which are often bounded by ancient, inactive faults or shear zones. Serpentinite is the dominant bedrock type at HPA and constitutes a block that trends northwest and extends to Fort Point. The potential variability in rock types and structure within the Franciscan Complex can create highly variable geologic and hydrogeologic properties over relatively short distances.

Stiff clays and dense sands overly bedrock along the southwest margin of the site. These units are not exposed at the ground surface, but are tentatively correlated with the "undifferentiated sedimentary deposits" of Bonilla (1971), and may be equivalent to the Colma Formation of Quaternary age (past 2 million years). Prior test borings indicate that this unit is present at depth in the central and northeastern portion of HPA. However, the overall distribution of this unit beneath the site has not been fully defined.

Within the San Francisco Bay estuary and over much of the low-lying areas of HPA, the bedrock and undifferentiated sedimentary deposits are blanketed by bay mud. These estuarine deposits accumulated during approximately the last 11,000 years and reach thicknesses of about 50 feet in some portions of HPA (*Lowney/Kaldveer, 1972*). The bay muds generally consist of soft, saturated plastic silts and clays with interbedded sand and peat. In many areas of the bay, the soft younger bay mud deposits grade at their base into stiff silts and clays termed older bay mud. While older bay mud deposits may be present in the offshore areas of HPA, insufficient test boring data are available to differentiate the older bay mud from the underlying undifferentiated sedimentary deposits. Consequently, all of the stiff soils logged to date beneath the younger bay mud are collectively grouped with the undifferentiated sedimentary deposits.

Ravine fill and slope deposits of gravelly and sandy clay have been mapped in upland areas of HPA (Bonilla, 1971). However, these surficial deposits were mapped in the 1920s, prior to substantial site grading. It is therefore possible that only remnants of these deposits remain.

Development of HPA has involved construction of fills over both bedrock and bay mud. Within the shipyard, fill is estimated to cover about 70 to 80 percent of the area, with bedrock exposed in the central upland area. The fill consists of two general types. The first type is material derived predominantly from excavation of bedrock to create level areas for shipyard activities. These fills vary in composition from those dominated by serpentinite and associated ultramafic rocks to mixtures of serpentinite and

Franciscan sandstone, chert, greenstone, and shale. The second type consists mainly of sandblast waste generated by shipyard activities. In the early to mid-1940s the Navy began placing these fills along the bay margin, primarily as a means of disposing these materials.

The site has experienced strong ground shaking as the result of several historical earthquakes. These include the 1906 San Francisco earthquake (Richter Magnitude 8.3) on the San Andreas fault and earthquakes in 1836 and 1868 (Richter Magnitude 7.0), centered on the Hayward fault. Strong ground shaking at HPA is likely in the future. However, there are no historical accounts of surface fault rupture within the site, nor are any active faults known to traverse the site. A north-trending fault has been mapped through the bedrock upland area; however, this is thought to be an ancient, inactive feature associated with the formation of the Franciscan Complex.

2.2.2 Hydrogeology

Few data are currently available regarding the local hydrogeology at HPA. Ground water occurs within the unconsolidated fill and alluvial materials and probably also occurs to a limited extent within the fractured bedrock underlying the site. The depth to water in the unconsolidated materials ranges from 2 to 12 feet below ground surface, while the depth to water within the bedrock is unknown. In general, ground water beneath the site probably flows radially from inland areas of higher elevation toward the bay. However, local ground-water flow directions may be quite complex due to variations in topography and the hydraulic properties of subsurface fill materials. In some areas, local flow directions may also vary temporarily due to the influence of tidal fluctuations of the bay and localized recharge from storm events.

2.3 Site History

Hunters Point was operated as a commercial dry dock facility from 1869 until December 29, 1939, when the property was purchased by the Navy. Following the purchase, the facility was leased to the Bethlehem Steel Company until December 18, 1941. On that date, the Navy took possession of the property and began operating it as a shipyard where naval ships and submarines were modified, maintained, and repaired. In addition, HPA was used for personnel training, limited radiological operations, research and development, and design of ships, and also provided nonindustrial services to Navy personnel and their families.

According to a July 1969 survey (*WESTEC, 1984*), there were 397 buildings used for industrial purposes and 57 buildings used for nonindustrial purposes at HPA. These facilities were distributed into three functional areas:

> Basic Industrial Production Area - This area was located in the northern and eastern portions of the shipyard and included the waterfront and shop facilities. The waterfront facilities consisted of 24,000 linear feet of pier, quay wall, and wharf space. There were forty 500-foot-long deep-water berths (twenty-one of which were fully equipped), six dry docks of various sizes, a regunning pier, and a crane support structure.
>
> Industrial Support Area - This area was located in the central and southwestern portions of the shipyard. These facilities included those operations, such as supply and public works, that provided support services to industrial production activities.
>
> Nonindustrial Area - This area was located in the northwestern and southern portions of the shipyard. The facilities included barracks, officers' quarters, and recreational facilities. Most of the disposal areas are also located in the southern portion.

In late 1975, the Navy's shipyard operations ceased and the property was placed under the control of the Navy's Office of the Supervisor of Shipbuilding, Conversion, and Repair, San Francisco (SUPSHIP-San Francisco).

In May 1976, most of HPA was leased under a five-year lease to Triple A, which operated it as a commercial ship repair facility. In addition, portions of the facility were subleased by Triple A to private warehousing, industrial, and commercial firms. In June 1981, Triple A's lease was extended for a second five-year term. This extension expired in June 1986, at which time the Navy began proceedings to retake possession of the property. Following actions taken by the DA, Triple A vacated the facility in mid-1987.

Activities by both the Navy and Triple A were related to ship repair, maintenance, and construction. As a result, similar materials were used by both groups, including paints, solvents, fuels, acids and bases, metals, polychlorinated biphenyls (PCBs), and asbestos. Information on waste generation and disposal by the Navy is presented in the Initial Assessment Study [IAS (*WESTEC, 1984*)] which covered the period from 1941 through 1974. Some information on the activities of Triple A from 1976 to 1987, has been developed by the DA (*DA, 1986*). No data are currently available regarding activities prior to 1941 (when the Navy took possession of HPA) or activities by Triple A's sublease holders. The history of waste generation and disposal at HPA is described below according to activities performed by the Navy (1941 to 1974) and activities performed by Triple A (1976 to 1987).

Additional information on the site history of HPA, is presented in Section 3.2, Field Investigations, including site-specific information for each site or area where contaminants are known or suspected to have been released. These site-specific descriptions include: 1) period of operation, 2) approximate quantities of wastes disposed or stored, 3) results of previous investigations, including the types and concentration ranges of contaminants found, and 4) discussions of Navy activities and alleged activities of Triple A.

2.3.1 Navy Activities

Naval activities involving hazardous materials have been classified into three categories:

- Chemical usage and waste generation - This category includes areas where hazardous materials were handled.
- Storage - This category includes areas where hazardous materials were stored for purposes of reuse or for later disposal.
- Processing and Disposal - This category includes areas where hazardous wastes were processed for recycling and on-site disposal.

These three categories are described in the following sections.

2.3.1.1 Chemical Usage and Waste Generation

This section divides chemical usage and waste generation activities at HPA into five groups depending on the type of operation -- structural, mechanical, electrical, services, and radiological. The activities of these five groups are discussed in the following text. The information presented below, including the estimates of volumes, the chemicals used, etc., was obtained from the IAS (*WESTEC, 1984*) and is summarized on Table 3.

Structural Group

Structural activities included shipfitting, welding, sheet metal, and boiler making operations. Shipfitting operations were located in Building 411 and in the adjacent Pickling and Plating Yard (IR-9, Plate 2). The locations of the remaining operations were not specified in the IAS. These operations generated both liquid and solid wastes, with the largest volume of waste produced by shipfitting operations. Shipfitting activities began in 1946 and ceased in 1975. Pickling processing was conducted from 1947 to 1973. The remaining structural group activities occurred primarily between 1944 and 1974.

The Pickling and Plating Yard is in an open-air, paved area. It contained acid storage tanks; open brick-lined pits for dipping large steel plates, and open plate storage racks. Chemicals used at this site included zinc chromate primer, sulfuric acids, sodium dichromate, and resin thinners. The IAS could not determine volumes of chemicals spilled from records, interviews, or site investigation; however, visual inspection showed significant amounts of primer residue and acid stains on the equipment, buildings, and ground. These residues are still present.

Prior to 1975 all liquid wastes from Structural Group operations were discharged to the combined sanitary/storm sewers (combined sewers), which flowed to the City of San Francisco's treatment plant or were occasionally discharged directly into the bay (Section 2.3.1.3). Estimated quantities of liquid wastes that originated from Building 411 are given in Table 3. Solid wastes (such as used ship components and empty chemical containers) from the Structural Group were disposed at the Industrial Landfill (IR-1), but quantities could not be determined.

<u>Mechanical Group</u>

Mechanical operations took place mainly in Buildings 134, 231, 253, and 258 (Plate 2). Both solid and liquid wastes were generated at these buildings. Table 3 summarizes the wastes generated for this group. Operations included tooling, forging, machining, and pipefitting.

Mechanical operations generally occurred between 1944 and 1974. A machining shop in Building 134 generated liquid wastes from metal cleaning and test boiler cleaning when heavy tools, valves, and pumps were serviced. These caustic solutions and rinse water were generated at an average rate of 1 gallon per minute (gpm). The Machine Shop cleaning facility in Building 231 generated 5,000 gallons of rinse water once per week and 3,000 gallons of chemical solution once per month. Chemical solution tanks contained sulfuric acid, phosphoric acid, sodium hydroxide, and dichlorobenzene. The Ordnance Shop in Building 253 generated liquid waste at an average rate of 2 gpm; liquid wastes from a 3,000-gallon chemical solution tank were discharged four times per year to the combined sewer. These wastes included sodium hydroxide, Stoddard solvent, and paints. The pipefitting shop in Building 258 generated chemical and acid solutions at a rate of 6,000 gallons per week. Chemicals included muriatic acid, sodium hydroxide, sulfuric acid, chromic acid, and penesolve and penestrip cleaners/solvents.

Liquid wastes from all these operations were discharged to the combined sewer systems. Solid wastes generated at the mechanical shops included chemical and solvent containers, metals, wood, plastics, and rags. These wastes were hauled to the Industrial Landfill at an average rate of 1 ton per month.

Electrical Group

Electrical operations took place in Buildings 123, 124, 211, 253, and 351 (Plate 2, Table 3). Operations occurred primarily from 1944 to 1974 and included repair of electrical, radar, and communication equipment, and overhaul of batteries, weapons, and mechanical and electrical equipment.

Battery overhaul operations, performed in the submarine battery shop and the electroplating shop (Building 123) generated the most significant amount of hazardous waste of the Electrical Group. The Building 123 battery overhaul activities occurred from 1944 to 1974 and generated used electrolyte solutions composed of sulfuric acid, water, and ash. The used electrolyte solutions were discharged at a rate of approximately 100 gpm into a storm sewer (apparently separate from the combined sewers) that fed into the bay.

The plating shop also located in Building 123 generated about 20 gpm of electroplating solution (acids, chromates, and heavy metals). Approximately

250,000 gallons of spent electrolyte solution contaminated with heavy metals were poured into floor drains that fed into the sewer system and discharged directly into the bay. Approximately 1,500 gallons of this contaminated electrolyte solution was estimated to have spilled onto the floor; presumably, residue may still be present on the floor. Cyanide wastes were also generated but were placed separately into containers and transported to the Industrial Landfill for disposal.

The submarine battery shop, also located in Building 123, was in operation from 1946 to 1974. Approximately 1.8 million gallons of spent acid was discharged into floor drains and eventually discharged into the bay. Approximately 10,000 gallons of lead-contaminated acid (contaminated from battery elements) were spilled onto the floor and loading dock area of Building 123 during the 28 years of operation.

Liquid waste consisting of diluted sulfuric acid was generated during electrical operations in the Acid Mixing Plant, Building 124. Washdown water was discharged through a storm sewer directly into the bay at a rate of 1,000 gallons per month.

The Electronic and Optical Shop located in Building 253 generated liquid waste consisting of sodium hydroxide, Oakite aluminum cleaner, and various paints. An average continuous flow of 2 gpm and periodic discharge of 300 gallons per month was released to the combined sewer. The Electronics Shop in Building 351 discharged Chem-mist detergent and very small quantities of alcohol and trichloroethylene to the combined sewer at about 1 gpm. No information was given in the IAS (*WESTEC, 1984*) regarding operations in Building 211.

<u>Service Shop Group</u>

This group consisted of a wide variety of auxiliary services to ships and the other production shops. These include shipwright services, small boat repair and maintenance, plastic parts manufacturing, waterfront and shop painting, abrasive blasting, rigging, equipment cleaning, pumping, pipefitting, and ship support services. These shops were located throughout the waterfront area and shipyard (Plate 2) and were operated from 1942 to 1974.

Abrasive blasting services generated most of the waste materials of this group (Plate 3). The abrasive blasters prepared metal surfaces for painting by removing old paint, rust, and barnacles and by smoothing uneven surfaces. Large scale abrasive blasting was performed on ships at Drydocks 2, 3, and 4.

Solid waste from spent abrasive sand contains rust, paint scrapings, and barnacles. HPA used 12,200 tons of abrasive sand per year, resulting in 14,400 tons of waste sand and scrapings. Approximately 475,000 tons of abrasive waste containing 85,500 tons of non-sand scraping material were generated during sandblasting operations over the 32 years of operation. The IAS estimated that 52,000 tons of this waste consisted of paint scrapings. Spent abrasive sand was hauled to the Bay Fill Area (IR-2) or to the Industrial Landfill. After World War II, some ships that had been involved in nuclear testing at Bikini Atoll were decontaminated at HPA. Radioactive sandblast wastes generated from these operations were apparently drummed and disposed off site (*Navy, 1982*).

<u>Radiological Group</u>

From 1950 to 1969, HPA supported a series of radiological defense laboratory research projects involving radioactive decay, properties of fallout, fallout effects on animals, and the physics of instrumentation and shielding. In 1969, all radioactivity studies ceased at HPA. A list of buildings used for radiological projects is included in Table 3.

During the 1950s, all buildings where radiological research was conducted were periodically surveyed for contamination. Any contamination found was cleaned up and all wastes were placed in 55-gallon drums which were encased in concrete. These drums reportedly were temporarily stored in a fenced, controlled, and monitored area at HPA; the location of this area is not clearly stated in the IAS, but will be addressed in the Navy's Hazardous Materials/Wastes Inventory (Section 2.7.6). The stored drums were periodically transported approximately 50 miles to the Farallon Islands by barge. The concrete-encased drums were released into the ocean, and allowed to sink to depths of about 1000 fathoms.

Radioactive waste material was also received on site at HPA from the University of California at Berkeley and from Lawrence Livermore Laboratories. These wastes were trucked to Berth 15, temporarily stored in 55-gallon concrete-encased drums, transported to the Farallon Islands by barge, and disposed in the ocean. An estimated 150 drums of radioactive wastes were handled, temporarily stored, and transported off the shipyard property each year between 1950 and 1959.

In 1955, the Radiological Defense Laboratory in Buildings 815 and 816 was completed. Liquid wastes generated in these buildings were held in a tank; it is not clear from the IAS whether the tank was located above ground or buried. The location of the tank will be further investigated in the Navy's Hazardous Materials/Wastes Inventory (Section 2.7.6) or Underground Tank Program (Section 2.7.4), as appropriate. The contents of the tank were monitored to determine if the effluent met standards for radioactivity-containing materials prior to release into the sewer system. If standards were not met, the liquid waste was hauled off the shipyard property by a licensed contractor to an approved Atomic Energy Commission (AEC) landfill. From 1960 to 1969 all liquid and solid radioactive wastes were transported off shipyard property. Some of these wastes were temporarily stored in Building 364 or at Area 707. Quantities of liquid or solid wastes transported and disposed during this time are unknown. No radioactive wastes were processed on HPA property.

In 1969, all radioactive sources and wastes at HPA were removed, including the pavement in Area 707. In 1969, 1979, and 1980, Buildings 364, 815, and 816, respectively, were thoroughly decontaminated. All waste material generated during this process was transported off the shipyard property, with the exception of the concrete sump behind Building 364, which was filled with concrete. In 1975 a health physicist again monitored all radiological areas of HPA under the direction of the AEC. No radiological contamination was found at HPA and the AEC concluded that the past radiological areas could be reused for any public or private operations without restriction.

2.3.1.2 Storage of Hazardous Materials

This section describes past storage of hazardous materials at locations throughout HPA as described in the IAS.

Ordnance Operations

Naval ordnance facilities were used for temporary storage of cargo ammunition and high explosive items. Ships scheduled to undergo repair or overhaul at HPA were relieved of their ammunition and explosives before they entered waters near the shipyard. From 1944 to 1974, only one area (the Explosive Storage Magazine located near the shoreline on the southeastern side of HPA) was used to store some small arms and some explosives. The Small Arms Magazine located near Building 813 was not used for ordnance operations.

Only small quantities of ordnance were handled at HPA and the IAS stated that there was no indication that storage or handling of explosives occurred anywhere else at the shipyard. Sometime after 1974, the Explosive Storage Magazine was demolished. No explosive storage facilities are currently required for ordnance operation.

No ordnance processing systems were present on HPA property. All ordnance handling connected with Navy vessels was accomplished outside HPA boundaries in other parts of the San Francisco Bay area.

Scrap Yard

The shipyard Scrap Yard (IR-4) is a storage facility for waste materials having commercial value as metal but which are no longer usable for the originally intended purpose. The yard is located east of the Industrial Landfill (Plate 2); it was in continuous operation from the 1940s until 1987 when Triple A vacated the property. The area is mostly unpaved but may have been oiled in the past to suppress dust. Scrap was delivered by shipyard public works trucks, stored, and transported off site, usually by rail or truck.

Materials stored there included used battery lead and copper, scrap steel, ship parts, electronic equipment from ships, and electrical capacitors. Since 1974, the Scrap Yard has not been used to handle battery lead and copper or electronics from ships. Approximately 1,000 capacitors were stored at the yard over the 30 years of operations. Many of the capacitors apparently each held one quart of PCBs. There is some evidence from interviews that these capacitors were crushed against a concrete wall and at other locations in the Scrap Yard and, therefore, PCBs may be present.

Salvage Yard

This yard was used for storage of salvage or surplus materials that could be reused for their originally intended purpose. The salvage yard is located south of the Scrap Yard and was operated from 1942 to 1974. The yard was used for the same purpose by Triple A. The IAS did not contain any information on hazardous materials at this site.

Old Transformer Storage Yard

The Old Transformer Storage Yard (IR-5) is located 400 feet north of Building 704 and was used from 1946 to 1974. Electrical transformers of various sizes were taken off ships or from elsewhere at the shipyard and transported to the storage yard for temporary storage at this unpaved open yard. The transformers were stored for indefinite periods of time and were periodically transported off site by a private contractor and sold as scrap or recycled. The IAS estimated an average of six to eight used transformers containing PCBs may have been stored each year for the 28 years of operation.

Storage Tanks

Between 1942 and 1974 there were approximately 45 aboveground and buried storage tanks at HPA. A list of tank numbers, tank type, capacity, location, and contents is provided in Table 4. Since 1975, 13 tanks have been removed. The IAS described only one set of tanks in detail. This Tank Farm (IR-6) is located north of Robinson Street and currently consists of ten aboveground storage tanks, including: one 184,150-gallon steel diesel tank, eight 12,000-gallon steel diesel tanks, and one 12,000-gallon steel lube oil tank. In addition to its use by the Navy, the Tank Farm was used by Triple A to store diesel and lube oil. Only one spill or leak has been confirmed (by the IAS) for either buried or aboveground tanks at HPA; in the early 1940s, one of the 12,000-gallon diesel tanks ruptured and its contents overflowed the Tank Farm berm area. The spilled oil was apparently cleaned up and placed in the Oil Reclamation Ponds. Also at the Tank Farm is an area from which eight 3000-gallon horizontal steel tanks were removed. The ground surface in that area is stained, apparently from leaks.

As described in Section 2.7.4, the Navy is beginning investigations of the underground tanks at the shipyard.

2.3.1.3 Processing and Disposal of Hazardous Wastes

Wastes were processed for reuse at the Oil Reclamation Ponds and were disposed at several locations at the shipyard. These operations are described in the following sections.

Oil Reclamation Ponds

Wastes generated at HPA by Navy activities were processed and disposed on site at various locations during the Navy's operations up until 1974. The only on-site location where wastes have been identified as having been processed at HPA is the Oil Reclamation Ponds (IR-2). The Navy operated the waste oil reclamation system, consisting of two ponds and a boiler, on the eastern shoreline of the Bay Fill Area from 1944 to 1974. The ponds were unlined and were constructed adjacent to the bay and on fill material. Oily wastes from ships and from other shipyard operations were hauled by truck from various areas in the shipyard or were pumped through an 8-inch-diameter pipeline from Berth 29. The liquid was heated to facilitate oil/water separation, and water drawn off during the process was discharged to the bay. The reclaimed oil was removed about three times a year by a private contractor, who sold much of it for road oil. The IAS estimated that about 0.6 to 2.0 million gallons of liquid waste was received annually at the Oil Reclamation Ponds. The ponds, which are about 30 feet from the bay, may be influenced by tidal action and oil may have leached to the bay. However, no estimate of the amount of liquid loss from the ponds by leaching is available and no visible evidence of leakage has been observed.

Burning Disposal Area

From 1942 to 1959, solid wastes generated at HPA were hauled away and disposed off site by a private contractor. Most of this waste was reportedly taken to a landfill in Brisbane, California. The exception was the period from 1945 to 1948, when domestic garbage was burned at the southeastern corner of the Bay Fill Area at the Burning Disposal Site. In this three-year period, approximately 23,000 tons of domestic solid waste was disposed and incinerated at this location. The site was graded and covered (presumably with fill) when it was closed in 1948. The IAS concluded that because the refuse was of a domestic nature, the site probably did not contain hazardous materials. However, the Burning Disposal Area has been included with the Bay Fill Area (IR-2) and is to be further investigated (Section 3.2.2).

Industrial Landfill

From 1958 to 1974, the shipyard disposed both solid and liquid wastes at the Industrial Landfill (IR-1) in the western corner of HPA. The site was apparently developed on fill material adjacent to the bay. Reportedly, little control was placed on the disposal of solid and liquid wastes at this site.

Solid wastes were generated by all shipyard operations and shop activities and are estimated to constitute about 1 million cubic yards of material. An estimated 235,000 tons of the solid waste were sandblast waste disposed in the Industrial Landfill, which may have contained an estimated 26,000 tons of paint scrapings. Although ships from the nuclear testing operations had been sandblasted at HPA, sandblast waste was reportedly not disposed on site but rather was taken to an off-site disposal area. Other solid wastes include an estimated 500 cubic yards of asbestos and about 6,000 pounds of dials and knobs containing fluorescent radium.

The types of liquid wastes disposed in the landfill were described in the IAS, which assumed that about 0.5 percent of the total waste disposed in the landfill was liquid. The following estimates of liquid waste disposal were provided in the IAS:

Bldg. No. Where Waste Was Generated	Type of Waste	Estimated Total Quantity (minimum gallons 1958-74)
134	Penesolve 814 Penestrip CR	2,000
253	NaOH, Stoddard solvent Stan Kleen, and paints	4,000
	Paint sludges	4,000
211	Paint sludges	1,000
271	Paint sludges	1,000
217	Paint sludges	1,000
435	Paints and paint sludges	2,000
302	Waste solvents, oils, and greases	2,000
231	Solvents and waste oils	4,000

The Industrial Landfill was closed in late 1974 by a military construction project (MILCON Project 262). Closure included drainage improvements to divert storm runoff from the hill area north of the landfill to an outfall near Berth 36 at the southeastern tip of the shipyard.

<u>Bay Fill Area</u>

From the mid 1940s to about 1978, the Navy disposed sandblast waste and associated paint scrapings, rust, barnacles and other fill material in the Bay Fill Area (IR-2) southwest of J Street. The IAS estimates that about half of the 475,000 tons of sandblast waste (237,500 tons) generated on site by ship maintenance was disposed at the Bay Fill Area. This waste is estimated to contain about 26,000 tons of paint scrapings.

Other metal debris and riprap have also been placed along much of the shoreline of the Bay Fill Area.

Storm and Sanitary Sewer System

From 1941 to 1977, sanitary, industrial, and storm wastewaters were carried by a combined sanitary and storm sewer system to the City and County of San Francisco's treatment plant. No processing or pretreatment of the wastewater occurred at the shipyard. When large storms would overload the combined sewer system, overflow would be diverted to outfalls that discharged into San Francisco Bay. It is estimated that this would occur about 9 to 12 times annually. The overflows were discharged at four locations: near Berth 4 at the north pier, at Berth 15 near the regunning pier, near Lockwood and Donahue Streets, and southwest of Mahan and J Streets.

In addition to the combined sewer system's periodic discharges, liquid wastes from the Battery and Electroplating Shop (Building 123) and the Acid Mixing Plant (Building 124) were discharged directly to the bay through a drain near Berth 64 at the northern corner of the shipyard. It is estimated that this drain carried about 12,000 gallons of wastewater per day to the bay between 1941 and about 1970. The wastewater contained sulfuric acid, solvents, hexavalent chromium, cyanide, copper, and lead from plating and battery overhaul operations. In 1977, the RWQCB filed an injunction against the Navy to prohibit direct discharge of sanitary and industrial waste into the bay. That same year, a military construction project separated the two sewer systems to correct this condition. Details of these sewer systems are being examined with regard to The Navy winterization investigation (Section 2.6.4).

Abandoned 55-Gallon Drums

In addition to the sites where long-term disposal took place, the IAS also identified a site west of Building 816 where seven 55-gallon drums were abandoned.

One of the drums was labeled "Styrene" and another "Pine Tar", with the remaining five not labeled. The drums were reported to be partially full and showed evidence of leakage. The spill associated with this leakage covered an area of about 200 square feet. The drums, reported to have originally been placed at this site in 1977, have been removed. An assessment will be made of this area; it is not now included as an RI/FS site.

A small incinerator near Building 815 was used from the mid 1950s to 1970 to destroy classified documents. Apparently no hazardous wastes were disposed in this incinerator.

Building 521 Power Plant

The Building 521 Power Plant (IR-11) operated from 1950 to 1969. During the IAS study, the site was found to contain 400 to 500 pounds of discarded waste asbestos, 15 unlabeled 5-gallon chemical containers, and one 5-gallon can of xylene. These were stored on the ground immediately outside the building. The asbestos is reported to have been washed by rainwater into the surrounding unpaved soil over the years. None of the containers shows visible evidence of leakage. Current information indicates that these materials or containers are still present outside the power plant; the 5-gallon containers and a pile of asbestos was observed on the eastern side of Building 521 on a concrete pad. These materials will be inventoried during the Navy's Hazardous Materials/Wastes Inventory (Section 2.7.6).

2.3.2 Triple A Activities

Triple A leased most (about 80 percent) of HPA from the Navy from May 1976 until June 30, 1986. However, because of a lease dispute, Triple A continued to occupy the site until June 15, 1987. The facilities operated by Triple A included six drydocks, adjacent berths, machine and electrical shops, a central power plant, a temporary power plant, and office, warehouse, and administrative service buildings. Additionally, Triple A subleased facilities at HPA to about 90 private firms.

Triple A's primary activities were ship maintenance and repair. Associated activities were facilities maintenance, as well as building demolition and renovation. The specific activities of Triple A's subleasees are not documented; however, most are reportedly associated with commercial and light industrial businesses.

The generation and disposal of hazardous wastes by Triple A was not studied as part of the IAS and there is little available information documenting these activities. Most of the information gathered about Triple A's alleged activities and presented here is associated with an on-going investigation by the San Francisco District Attorney (*DA, 1986*) and covers the period from 1983 to 1986. Virtually no information on hazardous waste disposal practices prior to 1983 is available. The DA's report used three primary sources of information about Triple A's alleged practices. These are:

- Observations by Navy personnel in 1986
- Observations and sampling/analytical testing by the DHS in 1986
- Descriptions by former Triple A employees of site activities from 1983 to 1986.

The Navy compiled a list of 19 sites where their personnel observed possible storage or disposal of hazardous materials by Triple A during 1986. One additional site where wastes were disposed was also identified by the DA's investigation. These sites, with available information about the types of waste, are listed in Table 5 and shown on Plate 2. As indicated in Table 5, the dominant types of waste allegedly generated by Triple A are waste oil/water mixes, solvents, and sandblast waste. Additionally, acids, asbestos, paint sludges, batteries, and PCBs were reportedly disposed in numerous locations throughout HPA.

In response to a complaint in 1986 by the Navy regarding alleged disposal practices by Triple A, representatives of DHS visited HPA. Samples of oil sludge from Tank 505 (located within IR-2) and pipe lagging in the Bay Fill Area were obtained at that time and were confirmed to contain PCBs and asbestos, respectively, at hazardous concentrations. During execution of a search warrant at the site in November 1986, the DHS obtained samples of soil, liquid, pipe lagging, rags, sludges, and solids at 12 of the Triple A sites. Subsequent chemical analysis indicated elevated concentrations of metals, PCBs, asbestos, oil, and grease (Table 5).

While specific quantities of waste are generally not well documented, a Triple A employee (Ship Superintendent) estimated that as much as 20 to 30 million gallons of liquids containing water, oil, waste solvents, and other materials were dumped onto the ground between 1983 and 1986 (*DA, 1986, Exhibit E, p.7*). The Triple A employee also estimated that the southwestern shoreline area (presumably the Bay Fill Area) was raised about 3 feet with sandblast waste during the period 1983 to 1986. Paint cans were also reportedly disposed in the shoreline areas. Other former Triple A employees interviewed by the DA indicated similar practices. In addition, a variety of garbage and industrial debris (including asbestos) was allegedly disposed in trenches and pits at various locations at HPA; these trenches and pits were subsequently covered with soil. The locations and quantities of waste in these pits is generally not known; however, the DA's office is currently investigating some of these areas.

2.4 Previous Studies

Several investigations have been performed to address potential contamination at HPA. Most of these investigations were performed as part of The Navy overall program to identify contaminants at the facility. Exploration has also been conducted prior to proposed construction, as a result of identified spills, or as part of the Army Corps of Engineers (COE) permitting process for dredging bay sediments. In addition, the DA's office has been conducting an investigation into Triple A's disposal practices. Table 6 presents a summary of previous field investigations at HPA. Numerous geotechnical investigations that are not summarized in this Scoping Document have also been conducted at HPA.

2.4.1 Navy Assessment and Control of Installation Pollutants Program

The Navy Assessment and Control of Installation Pollutants (NACIP) program was developed to identify and control contamination at naval installations and is similar to the EPA's Superfund program. The Navy program has since been renamed the Installation Restoration (IR) Program. The first step of the IR Program is the Preliminary Assessment, in which existing information on contamination at a site is collected and evaluated; this step has been called the Initial Assessment Study (IAS). The second step, now called the Remedial Investigation (RI), was formerly known as the Confirmation Study, and encompassed both the Verification and Characterization Steps of the NACIP program. The Verification Step has been completed in some of the sites and on-site investigations will be performed to achieve the characterization step that evaluates the extent of contamination. For other sites, including the Triple A sites, preliminary assessments will be or are being conducted.

2.4.1.1 Initial Assessment Study

The IAS for HPA was completed in 1984 (*WESTEC, 1984*) and focused on past use, storage, and disposal of materials. Current operations were considered to be regulated by routine monitoring performed by the Navy. The IAS consisted of: 1) review of available records on chemical handling and disposal practices, 2) interviews with site personnel, and 3) an on-site survey of activities at HPA. Using these data, the

IAS recommended sites for further investigation if sufficient evidence existed that contaminants were present and that they posed a threat to human health or the environment. The information developed by the DA's office regarding Triple A's activities was not available at the time of the IAS.

The IAS identified 12 areas at HPA where wastes were disposed or spilled. At six sites, further investigation was recommended by the IAS because of potential threats to human health or the environment. These six sites are:

- Industrial Landfill (IR-1)
- Bay Fill Area (IR-2)
- Oil Reclamation Ponds (IR-3)
- Scrap Yard (IR-4)
- Old Transformer Storage Yard (IR-5)
- Battery and Electroplating Shop (IR-10)

Three of the twelve sites were not recommended by the IAS for further investigation. These were:

- Burning Disposal Site (included in IR-2)
- Tank Farm (IR-6)
- Bay Sediments

Although solid, refuse-type waste was burned at the Burning Disposal Area, the IAS found no evidence that disposal of hazardous or liquid wastes occurred and therefore, the IAS did not recommend further investigation. Evidence of past spills was observed at the Tank Farm; however, the IAS concluded that further investigation was not warranted because migration of the oil would be limited by a surrounding berm. Although contaminants have been found in the Bay Sediments, the IAS did not recommend further work, but rather concluded that these sediments were best left undisturbed as they would pose a greater threat to the environment if disturbed.

The remaining three sites were recommended by the IAS for corrective action but not for further investigation. These sites were:

- Abandoned 55-gallon drums (near Building 816)
- Pickling and Plate Yard (IR-9)
- Building 521 Power Plant (IR-11)

Seven 55-gallon drums containing unknown materials were found near Building 816 and evidence of spills was observed. The IAS recommended that the drums be sampled and properly disposed and that soil contamination be evaluated depending upon the results of the drum sampling. According to the Navy, the drums have been removed. The IAS concluded that, because the Pickling and Plate Yard was lined with concrete and the drains discharged into a sanitary sewer system (separate from the storm sewer system), contaminants would be prevented from reaching the ground water or the bay. Therefore, this site was not recommended by the IAS for further investigation. However, the IAS did recommend that the zinc chromate residue present at the facilities be removed; the Navy is developing plans for the removal of this residue. The IAS recommended that waste asbestos and abandoned containers found outside the Building 521 Power Plant be removed, but did not recommend further investigation. The Navy is in the process of contracting for the removal of the asbestos.

2.4.1.2 Confirmation Study, Verification Step

The next phase of the IR program consisted of an investigation to verify the presence (if any) of contaminants (*EMCON, 1987a*) at the sites identified in the IAS. This phase was called the Verification Step of the Confirmation Study (Verification Step) in the NACIP terminology. The six sites recommended by the IAS for further work were included in this preliminary investigation. In addition, based on recommendations from regulatory agencies, four of the IAS sites not initially recommended for further investigation and one additional site were investigated. The data from the DA's investigation were not available and, therefore, the Triple A sites were not included in the Verification Step investigation. The 11 sites investigated in the Verification Step were:

- Industrial Landfill (IR-1)
- Bay Fill Area (IR-2)
- Oil Reclamation Ponds (IR-3)
- Scrap Yard (IR-4)
- Old Transformer Storage Yard (IR-5)
- Battery and Electroplating Shop (IR-10)
- Tank Farm (IR-6)
- Bay Sediments
- Pickling and Plate Yard (IR-9)
- Building 521 Power Plant (IR-11)
- Sub-Base Sandblast Fill, Painting and Additional Areas (the area not investigated in the IAS) (IR-7)

The scope of the Verification Step included ground-water monitoring well installation, soil and ground-water sampling, and limited sampling of air, sludges, and residues. The samples were submitted for chemical analysis to determine the type and concentration of contaminants present. In addition, existing chemical data from bay sediment samples were examined.

The Verification Step found contaminants in varying concentrations at all 11 sites. The contaminants included volatile organic compounds (VOCs), semivolatile organic compounds (SOCs) commonly associated with petroleum products, polychlorinated biphenyls (PCBs), and heavy metals. These sites (except for the Bay Sediments) and the contaminants present are described in greater detail in Section 3.2 of this Scoping Document. Data tables from the Confirmation Study, Verification Step (EMCON, 1987a) are contained in Volume II, Appendix A of this Scoping Document.

2.4.1.3 Subsurface Investigations for Proposed Galley

Additional investigations were performed within one of the previously identified NACIP sites, the Bay Fill Area (Plate 2). In this location, the Navy is planning to construct a dining facility, the Galley, as part of its MILCON program. Because the proposed facility is within a potentially contaminated area and elevated copper and zinc concentrations were detected in one soil sample from the vicinity during the Verification Step, two additional investigations were performed in this area (*ERM-West, 1987a, and HLA, 1987*). Data tables from these two reports are contained in Volume II, Appendices B and C of this Scoping Document.

The purpose of the HLA investigation was to assess whether 1) the construction site contained hazardous materials (focusing on the metals) that would pose a human health threat sufficient to preclude construction or 2) construction would adversely affect adjacent remedial activities on other problem sites. Soil and ground-water samples from test borings, and water samples from a monitoring well were collected and analyzed. Low levels of petroleum hydrocarbons were detected in the site soils, which were mostly sandblast waste. Although metallic fragments were observed in the soil, the metal concentrations in the soil were not significantly high and metal concentrations in the ground-water samples were low or not detected.

The investigations indicated that construction would not pose a threat to human health nor adversely affect adjacent investigation or remedial activities, if required. Additional field work is planned for this Galley site.

Additional investigation of the entire Bay Fill Area will be conducted as part of the RI process and is discussed in Section 3.2.2.

2.4.2 Area Survey

An investigation of soil contamination at potential future construction sites was conducted during 1986 and 1987 (*EMCON, 1987b*). This investigation was limited to areas where emplaced fill was present outside the sites at which contaminants had previously been identified (Section 2.4.2), and to depths of within 5 feet of the ground surface. The areas of investigation are shown on Plate 2. Soil borings were drilled on a grid pattern with approximately 200-foot centers in areas where construction was most probable (Study Area A). In areas where construction was less probable, borings were drilled on a grid with approximately 400-foot centers (Study Area B). The analytical program involved analysis of composite and selected discrete soil samples for asbestos, VOCs, SOCs, and selected heavy metals (chromium, copper, lead, nickel, and zinc). In addition to the soil sampling program, a field reconnaissance was performed by a certified industrial hygienist who collected samples of material that appeared to contain asbestos. Data tables from the Area Study (EMCON, 1987b) are contained in Volume II, Appendix D of this Scoping Document.

Elevated concentrations of metals (lead, nickel, copper, and zinc) were found at several locations in Study Area A. Some of the elevated nickel concentrations may be naturally occurring because the serpentinite-derived soils are high in nickel content. Approximately half the soil samples from Study Area A contained elevated levels of asbestos; however, most of these were reported to be naturally occurring asbestos found in local serpentinite bedrock. In addition, low levels of petroleum-related organic compounds were detected in some soil samples. Soil samples from one boring drilled adjacent to an abandoned transformer pad contained PCBs at 450 mg/kg. This boring is in the Bay Fill Area and will be investigated as part of the RI process.

Samples from Study Area B contained low concentrations of petroleum-related compounds distributed in an apparently random manner. Natural and manmade asbestos, in concentrations greater than 1 percent, was also detected in 19 of 45 samples. VOCs were not found in high concentrations in either study area.

The report concluded that although asbestos and other hazardous chemicals were found in varying concentrations, there were no indications of immediate hazards to human health at the ground surface. Asbestos-containing material identified in this study is planned for removal (Section 2.6.2). PA/SIs will be performed to investigate areas of elevated concentrations identified in this Area Study.

2.4.3 Building 503 PCB Spill

In 1986, a suspected PCB spill east of former Building 503 was discovered by the Naval Public Works Department during repair of an underground utility line. Possible PCB sources in the area include a transformer pad and transformers on power poles southeast of former Building 503. Results of investigations at this site are summarized in Sections 2.6.1 and 3.2.8 and data tables from the previous investigations are contained in Volume II, Appendix E of this Scoping Document (ERM-West, 1986a, b; 1987b). Verification sampling and additional excavation are currently being performed. As previously discussed, this site has been named IR-8 and is included in the RI.

2.4.4 Triple A Sites

As previously mentioned, at the present time the only available information regarding alleged hazardous waste disposal by Triple A consists of an investigation performed by the DA's office (*DA, 1986*). The information in the DA's report was discussed in detail in Section 2.3.2 and summarized on Table 5. Data tables from the DA's report are contained in Volume II, Appendix F, of this Scoping Document.

The DA investigation included interviews with former Triple A employees and with Navy personnel. In addition, samples from areas of obvious contamination were collected and analyzed by the DHS. The DA investigation identified and numbered several sites (Plate 2). An additional unnumbered site near the corner of Donahue Street and Innes Avenue was later identified. All but one of these Triple A sites are in the southern portion of HPA; this distribution may be due to the areas which come under jurisdiction of the DA's office.

According to information developed in the DA's investigation, a variety of wastes were allegedly disposed by Triple A, including waste oils, paints, waste solvents, sandblast waste, PCB, asbestos, and industrial debris. In some cases, the wastes were reportedly placed on the ground surface while, in other cases, trenches or ponds were apparently excavated into which liquid and/or solid wastes were placed.

PA/SIs are proceeding at several Triple A sites (Section 3.2.12) where a limited number of test borings have been drilled and limited soil sampling has been performed to verify the presence, if any, of contaminants. As previously discussed, the Triple A sites have been incorporated and combined, where appropriate, with the IR sites as shown on Table 1.

2.5 Chemical Conditions

The results of previous investigations throughout HPA indicate that inorganic and organic chemicals are present at varying concentrations at many on-site locations. Samples from the Oil Reclamation Ponds, Industrial Landfill, and Bay Fill Area generally had the highest concentrations and largest number of detected chemicals relative to samples from other sites. Potential hazards identified in the Area Study (*EMCON, 1987b*) included asbestos-containing materials, which are planned for removal.

The chemicals detected in soil and ground water include VOCs, SOCs, PCBs, oils, heavy metals, and asbestos. Soil appears to be affected by contamination to a greater degree than ground water, although few ground-water samples have been collected. Although sources of radioactive contamination are suspected at the landfill, results of gross alpha and beta analyses were inconclusive.

Maximum chemical concentrations detected in soil and in ground-water samples from each of the sites are shown in Table 7 and Table 8, respectively. These tables do not include the data described in the DA's investigation (*DA, 1986*), because sample locations for that investigation are approximate. Additional descriptions of the chemical conditions are presented in Section 3.2.

2.5.1 Past Data Validation

To establish the appropriateness of using previously collected data in preparing this Scoping Document, an evaluation of past data was performed. Because the validity or usefulness of the data depends on the intended uses, possible uses for the data were evaluated to determine the level of past data validation required. In general, data uses such as risk analyses and remedial action planning require the greatest degree of data validation. In consultation with the EPA Region IX Federal Facilities Coordinator (EPA, pers. comm.) it was determined that for this Scoping Document the previous data would be used only to define areas where containments were likely to be present or absent and to develop the conceptual approach to the field investigation. The EPA agreed that for these purposes the validity of the data could be established by verifying that previous reports contained a reasonable level of data documentation.

The validation process consisted of reviewing the reports described in Section 2.4. Available data from previous reports were reviewed to define areas in which chemicals were either present or absent. Ranges of chemical concentrations as well as other data were also qualitatively evaluated to provide an indication of the approximate level of contamination. For example, that floating product was reported in some borings conveys useful information for developing and refining the proposed field work. In many cases, as shown on Table 9, these reports contain specific information regarding sampling procedures, analytical methods, monitoring well or boring locations, and QA/QC procedures. Appendices to these reports also commonly contain photocopies of certified laboratory reports, chain of custody records, field logs, and drafted logs. This type of information clearly indicates that the date are appropriate for use in preparing this Scoping Document. In general, the reports described in Section 2.4 contain an adequate level of documentation to indicate the data could be used for screening purposes.

This past data validation shows that the previous data are adequate for developing this Scoping Document. The data were used only as a screening mechanism in the scoping process; this use is appropriate based on our assessment of the data. A more rigorous validation could conceivably be performed in the future; the necessity of further validation depends on future possible uses of the data.

2.6 Interim Remedial Measures

Interim remedial measures have been or are being planned for several sites at HPA to remove known contamination sources that present potential hazards. These areas include an area near former Building 503, several areas where asbestos debris was disposed or stored on the ground surface, and several areas where cleanup and disposal of facilities are planned. In addition, a Winterization Program is currently being developed to mitigate possible erosion of chemical-bearing soils to San Francisco Bay. The areas to be remediated and the Winterization Program are described in greater detail below.

2.6.1 Building 503 PCB Spill

Soil contamination by PCBs was discovered in 1986 in the vicinity of former Building 503 during routine repair activities. To clear the area for planned future construction, investigations were performed to characterize the distribution of PCBs in soils (*ERM-West, 1986a, 1986b, and 1987b*). After initial characterization of the contaminated area, an interim cleanup plan was developed by the Navy in consultation with the DHS, the RWQCB, and the EPA (*Navy, 1987a*). Soils containing PCB concentrations greater than 25 milligrams per kilogram (mg/kg) were to be removed and transported to an off-site disposal facility. To date, a total of 1,255 cubic yards of PCB-containing soil has been removed. Soil samples are to be collected at the limits of the excavation to verify that soils containing greater than 25 mg/kg have been removed. Additional excavation is still planned.

The Navy is currently continuing interim remedial activities in accordance with regulatory agency guidance and review. The site has been included in the RI. The RI will focus on full characterization of the contamination and evaluation of the ground-water quality.

2.6.2 Asbestos Areas

Asbestos contamination has been identified at the surface in several areas at HPA. These areas include: 1) the Industrial Landfill and Bay Fill Area, 2) the area bordered by the Scrap Yard, Spear Avenue, and "I" and "J" streets, 3) the area bordered by San Francisco Bay, and Manseau, "H", and "I" streets, and 4) the area bordered by San Francisco Bay and Galvey Avenue. The asbestos contamination found at these areas generally consists of asbestos-containing debris such as pipe lagging or tank insulation. These areas will be remediated according to the guidelines presented in *The State of California Fact Sheet, Asbestos Handling and Disposal*, March 1987. Friable waste and debris will be packaged in impermeable containers and disposed in an approved landfill. Nonfriable materials will also be collected. No soil removal is planned; however, asbestos-containing soil may be covered with clean soil in limited areas, if necessary. Verification sampling will be performed to demonstrate that the areas have been remediated to appropriate regulatory levels. The Navy is in the process of preparing a contract for removal of the asbestos.

2.6.3 Removal Actions

Plans are currently being formulated to conduct removal actions at several areas at HPA. Conceptual plans have not been finalized but anticipated actions are summarized below:

- Pickling and Plate Yard (IR-9) - The structures coated with zinc chromate residue are to be removed. These structures include the pickling tanks, acid tanks, drying racks, support structures, and a small building.

- Battery and Electroplating Shop (IR-10) - The residues on the floor in the shop areas of Building 123 are to be removed. It is not known if structural removal/demolition will also occur.

- Building 521 Power Plant (IR-11) - The asbestos-containing materials outside the building are to be removed as described in Section 2.6.2. The building is to be isolated by sealing the windows and doorways. Battery casings inside the building will be removed.

- Tank S-505 (within IR-2) - The contents of the tank will be sampled to determine disposal methods. The tank will be dismantled and removed. Soil removal might also occur.

- Tank Farm (IR-6) - The tank contents are to be sampled and removed. The tanks, associated aboveground piping, and structures will be removed. It has not yet been decided if the buried piping and stained soil will be removed.

Currently, plans are being formulated to identify and evaluate removal alternatives.

2.6.4 Winterization Program

At the request of the RWQCB (1987), the Navy is currently evaluating possible measures to "winterize" portions of the site for the approaching rainy season. The objective would be to develop a program as an interim action to prevent surface-water run on and minimize runoff from the identified IR and PA sites. Additionally, a program to sample surface soils that may contain contaminants and storm-generated runoff may be developed. To date, a preliminary review of available data and a site reconnaissance have been performed by HLA staff to evaluate the general surface runoff characteristics of the site and to review the location of existing storm drain systems. A joint site visit by HLA and RWQCB staff is planned to further evaluate the scope for a winterization program. Based on the outcome of the site visit, additional hydrologic and engineering analysis may be performed to develop a sampling program and plans/designs for specific types of winterization measures (diversion structures, improvements to existing drainage structures, covering of some areas, etc.). These measures, after review by the RWQCB, will be implemented by the Navy.

2.7 Ongoing Investigations

In addition to the areas to be investigated during the RI, several investigations are currently being performed or are planned. These investigations are not part of the RI and will be reported separately. However, data obtained in these investigations may result in sites being added to the RI as described in Section 3.2.13. These ongoing investigations include the studies described below.

2.7.1 MILCON Site Studies

Investigations will be conducted at several proposed military construction (MILCON) sites. The specific objectives of each site study will include:

a. Assess the proposed site for levels of chemicals that could preclude construction.

b. Evaluate the site for localized chemicals that may be mitigated prior to, or during, construction.

c. Assess the potential impact of construction on potential remedial studies/actions at other adjacent sites.

d. Assess the potential health impacts of chemicals, if present, to the construction workers.

e. Assess the potential health impacts of chemicals, if present, to the occupants of the facility.

Upon completion of a site investigation, the Navy will assess the data relative to the elements described above to determine the suitability of that site for construction. With the exception of the ongoing investigations at South Pier and the proposed Galley (Sections 2.7.2 and 2.4.1.3), work plans will be submitted to the appropriate regulatory agencies prior to initiation of field work.

The fiscal year (FY) 1988, 1989, and 1990 MILCON projects are:

FY 1988 - South Pier Extension and Power Plant
Galley

FY 1989 - Public Works Compound
Operations and Maintenance Facilities
Administration/Training Facilities
Utilities/Site Improvements (Miscellaneous Locations)
Medical/Dental Facilities

FY 1990 - North Pier Modifications

2.7.2 South Pier Site Survey

Several borings have been drilled and soil and ground-water samples collected in the vicinity of the South Pier, where a MILCON project is scheduled for FY 1988. This area is within Study Area A of a previous investigation (*EMCON, 1987b*). Additional field activities include sampling of several transformers. Preliminary plans call for the removal of a 5-gallon bucket of oil on the pier, PCB-containing debris at a transformer near the pier, and oil-stained soil near the pier.

2.7.3 Housing Site Investigations

Development of housing facilities is planned for FYs 1988, 1989, and 1990. These housing areas have been subdivided into five sites, all located in the northern part of the shipyard. Recently, soil borings were drilled in two of these housing areas and air samples were collected at various locations in surrounding areas. Reports on these investigations are being prepared for agency review. Additional borings are planned for two other housing sites.

2.7.4 Underground Tank Program

The Navy is undertaking an investigation of underground tanks at HPA. The initial tasks will be to inventory and locate these tanks (see Section 1.1).

2.7.5 Triple A Site Investigations

PA/SIs have been started by the Navy at a number of Triple A sites. These sites are described in Section 3.2.12. In addition, the DA's office is planning additional sampling at several locations based on information developed in their investigation.

2.7.6 Hazardous Materials/Wastes Inventory

A surface inventory to locate, identify, and quantify possible hazardous materials at HPA is planned. This inventory will include Navy sites as well as areas currently leased to private companies. Mobile equipment, surface abandoned containers, aboveground tanks, motor vehicles, and their contents which may contain potentially hazardous materials will be inventoried. Buildings, storage areas, machine shops, maintenance yards, piers, and dry docks will be also inventoried for potentially hazardous materials or PCB-containing equipment.

3.0 REMEDIAL INVESTIGATIONS

The activities to be performed for the RI include preparing planning documents, assessing and evaluating available data, performing field investigations, and preparing RI reports. For each of these activities appropriate state and federal guidance documents will be used, including *Guidance on Remedial Investigations under CERCLA* (*EPA, 1985b*) and the State of California Health and Safety Code, Division 20, Chapter 6.8. Additional guidance documents that will be used for preparing planning documents are cited in the following sections.

As previously mentioned, several sites have been identified as containing hazardous materials and will be addressed in the RI. These sites will be referred to as the IR sites; they include ten sites investigated in the Verification Step and the former Building 503 PCB spill site. The IR and PA sites and the current numbering system are listed in Table 1. Several of the IR sites include Triple A sites within their boundaries.

HPA will be investigated on a site-by-site basis. As discussed in Section 1.1, the results of these investigations may be presented in RI reports combining several sites, if appropriate. The specific sites to be investigated are shown on Plate 2 and include:

- Industrial Landfill (IR-1)
- Bay Fill Area (IR-2)
- Oil Reclamation Ponds (IR-3)
- Scrap Yard (IR-4)
- Old Transformer Storage Yard (IR-5)
- Tank Farm (IR-6)
- Sub-Base Sandblast Fill, Painting, and Additional Areas (Sub-Base Area) (IR-7)

- Building 503 PCB Spill Area (IR-8)
- Pickling and Plating Yard (IR-9)
- Battery and Electroplating Shop (IR-10)
- Building 521 Power Plant (IR-11)

In addition, preliminary investigations are currently being performed at several Triple A sites (Plate 2 and Section 3.2.12) and additional information will be evaluated for the Other Areas (Section 3.2.13). Additional characterization of these sites is not addressed in this Scoping Document because insufficient data currently exist to evaluate the presence or absence of hazardous materials. If these preliminary investigations indicate that hazardous materials are present at these sites, the sites will be addressed in subsequent sampling plans, RI reports, or combined with the RI reports described in this Scoping Document, as appropriate.

Additional soil and ground-water sampling will likely be performed in other areas of HPA based on the results of the PA/SIs, as described in Section 3.2.13.

3.1 Data Gaps

One objective of the RI is to gather sufficient data to adequately characterize a site such that the feasibility of several remedial action alternatives can be evaluated and an appropriate remedial action alternative can be selected for implementation. According to an EPA guidance document (*EPA, 1985b, p. 7-6*), remedial investigations should be undertaken only to the extent "necessary and sufficient" to fulfill the requirements of subsequent remedial action implementation. This investigation, to the extent possible, is designed to gather appropriate data and perform necessary analyses that will result in an "accurately focused and cost-effective study," consistent with the intent of the EPA guidance documents (*EPA, 1985b, p. 7-3*).

Chemical analyses have been performed on numerous air, soil, and ground-water samples collected during previous investigations at HPA (Section 2.4). These data provide the basis for developing this Scoping Document. Following review of the available data, a number of data gaps have been identified. Overall, the data gaps result from the relatively narrow scope of many of the previous investigations. To eliminate these data gaps, field investigations will be performed in some areas to further evaluate the horizontal and vertical distribution of chemicals and to further evaluate possible migration pathways in air, soil, and water. In other areas, additional information will be obtained to evaluate the possible presence of contaminants (Section 3.2.13).

Specific data gaps which, to the extent possible, will be addressed in this RI include, but are not limited to, identification of the following items:

- Chemicals of concern
- Source characteristics
- Contaminant distribution in air, soil, and water
- Possible migration pathways and exposure routes in each medium
- Geologic and hydraulic factors that affect ground-water movement
- Background and baseline concentrations

To eliminate these data gaps, additional investigations will be performed or additional information will be evaluated. As described in Section 3.2, air, soil, and ground-water samples will be collected and analyzed for a variety of chemicals. Soil borings will be installed to permit soil sampling. Ground-water samples will be collected from existing and proposed monitoring wells. Water levels will also be measured in the wells to permit estimation of ground-water flow velocity. Air samples will be collected at the site to investigate the possible presence of airborne contaminants.

Because HPA is a large and complex site, data gathering will consider the types and nature of past or current site activities. The purpose of this sampling will be to further refine the distribution of chemicals and to aid in an increased level of past data validation (Section 2.5.1).

The data needs for each identified IR site are described in general terms in the following sections. The approximate number of sampling locations and the types of field investigation techniques proposed for each site present the Navy's conceptual approach to these field investigations and are based on preliminary evaluation of existing data. The final scope of these site-by-site investigations will be presented in the Sampling Plans and may be further revised based on data that become available as the field work proceeds. This approach will facilitate necessary and appropriate modifications that might be needed to meet site-specific objectives.

3.2 Field Investigation

The objectives of the data collection effort to be conducted during the field investigation are: 1) to characterize the type and extent of contamination in soils, sediments, surface water, ground water, and air; 2) to evaluate contaminant migration pathways and potential routes of exposure; 3) to support evaluation of potential remedial measures; and 4) to support evaluation of public health and environmental impacts. Field methods that might be used include:

- Geophysical surveys

  Surface geophysical methods, such as magnetometer and ground penetrating radar (GPR) surveys, will be used to identify the locations of buried objects and to locate buried utility lines prior to drilling at a site. The extent of artificial fill may be evaluated using electromagnetic (EM) surveys and GPR. If needed, seismic methods might be employed to identify stratigraphic units and depths to bedrock.

- Soil gas surveys

Field analyses of volatile organic compounds in soil gases may be used to provide relatively rapid information about the lateral distribution of organic chemicals in the subsurface. Such information often aids in selecting soil boring and monitoring well locations.

- Radioactivity surveys

  Surface and subsurface monitoring for radioactivity will be performed in areas where radioactive sources are suspected. Prior to the field work, a surface survey will be performed where radioactive wastes are suspected at the ground surface. During drilling or trenching, radioactivity monitoring of subsurface soils will be performed. In the event "hot spots" are encountered, subsequent investigations will be revised. A certified industrial hygienist will supervise all radioactivity monitoring.

- Drilling of test borings

  Test borings will be drilled to obtain data on subsurface conditions and to collect soil samples.

  Ground-water samples will be collected from selected test borings for screening purposes and to assist in placement of monitoring wells. These samples will be collected and analyzed in addition to ground-water samples from monitoring wells.

- Drilling of deep pilot borings

  Pilot borings will be drilled to obtain data to be used to characterize the lithology and to site and design deep monitoring wells.

- Excavation of test pits or trenches

  Test pits or trenches will be excavated at selected locations to observe the subsurface soil conditions over an area larger than can be observed with a test boring and to collect samples from specific horizons.

- Soil and sediment sampling

  Soil and sediment samples will be collected for chemical and physical analysis. In general, soil samples will be collected at lithologic changes or at least every 5 feet in shallow borings (less than 30 feet deep). Deep borings may will be sampled at lithologic changes or at intervals greater than 5 feet when a shorter sampling interval is not warranted. At least one sample from each boring will be collected within 1 to 2 feet of the ground surface. Sediment samples may be collected from areas adjacent to known contaminated sites. The final sampling intervals for each site-specific investigation will be presented in the sampling plans.

- Installation of monitoring wells

Monitoring wells will be installed to obtain ground-water samples, measure water levels, and perform aquifer tests. Piezometers may be installed to measure water levels.

- Water sampling

  Ground-water samples will be collected from monitoring wells and selected test borings for analysis to evaluate water quality. Data from the initial sampling rounds will be evaluated prior to providing recommendations for long-term ground-water monitoring.

- Ground-water monitoring

  Long-term ground-water monitoring programs will be established to assess areal and temporal changes in water quality and ground-water flow directions and gradients. Chemical analyses may include testing for identified contaminants as well as general inorganic analyses to characterize ground-water quality.

- Water-level measurements

  Water levels will be measured in new and existing wells to provide data for use in evaluating the hydrology beneath HPA.

- Aquifer testing

  Aquifer testing will be performed to obtain information on ground-water flow velocities and other aquifer parameters.

- Tidal influence studies

  Establishing the interconnection between the shallow ground water and the bay is anticipated for assessing the potential impact of ground-water migration to the bay. Selected monitoring wells will be instrumented with automatic water-level recorders to measure water level response relative to tidal changes in the bay.

- Air sampling

  Air samples will be collected to assess chemical concentrations in the air.

- Biota sampling

  Marine (bay) organisms may be collected to provide data to evaluate the effect contaminants may have on the bay.

Subsequent to submittal of this Scoping Document, additional field activities and/or methods may be selected for use during the RI. Such additional methods will be presented and discussed in the QAPP and/or Sampling Plan, as appropriate.

The remaining portion of Section 3.2 describes the individual IR sites (all located on Plate 2) and the anticipated field approach proposed for each site. The field investigations will also focus on those areas within the IR sites where Triple A disposal activities were reported. Locations of existing borings and wells are shown on Plate 5. Table 10 summarizes the proposed field investigation for each site. Some field methods will be utilized at all sites and, therefore, have not been included in the individual site discussions which follow. These methods include clearance of drilling locations using geophysical techniques, sampling of existing wells, and measurement of water levels. The field investigations outlined below represent a preliminary scope of work and thus ranges are provided for the number of test borings and monitoring wells, etc. The scope will be finalized and presented in the individual Sampling Plans.

3.2.1 Industrial Landfill, IR-1

The Industrial Landfill was used between 1958 and 1974 for the disposal of domestic, industrial, construction, and other wastes. Included in these wastes were an estimated 21,000 gallons of liquid chemical wastes, 500 cubic yards of asbestos, and 6,000 pounds of dials and knobs containing fluorescent radium. Although most of the waste was reportedly disposed off site, it is possible that radioactive sandblast waste from ships decontaminated after nuclear testing at Bikini Atoll may be present at the landfill (*Navy, 1982*). During the 16 years of landfill operation, approximately 20 acres of San Francisco Bay were filled with waste material. In late 1974, the landfill area was covered with clean fill material and landscaped with natural grasses. In addition, a storm-water interceptor line was constructed to prevent surface runoff from inundating the landfill. Soon after the landfill was covered, leachate was observed flowing from the landfill into the bay and, in 1975, an unsuccessful attempt was made to construct a slurry wall along the bay front to prevent leachate migration. Since its closure, additional wastes have apparently been disposed at the Landfill, presumably by Triple A.

During the Verification Step (*EMCON, 1987a*), nine shallow ground-water monitoring wells, ranging from about 11 to 32 feet deep, were installed in the vicinity of the Industrial Landfill. Three soil samples were collected from each well boring and analyzed for VOCs, SOCs, PCBs, and priority pollutant metals. Sample depths ranged from 1 to 11 feet below ground surface. Water levels ranged from 2 to 12 feet below ground surface.

VOCs were detected in soil samples from Wells I-2, I-3, I-4, I-5, I-7, and I-8, with the highest concentrations occurring in samples from Well I-5 in the eastern half of the landfill. VOC concentrations up to 42,000 micrograms per kilogram (μg/kg) were detected in soil samples from Well I-5 while concentrations in soil samples from other wells ranged from 3 to 300 μg/kg. SOCs were detected in soil samples from all wells. Again, samples from Well I-5 contained the highest concentrations (up to 230,000 μg/kg) but samples from Wells I-2, I-3, and I-4 also exhibited concentrations exceeding 1000 μg/kg.

Priority pollutant metals were detected in soil samples from all well borings. Lead was detected in soil samples from Wells I-3, I-4, and I-9 at concentrations up to 4,100, 8,400, and 52,000 milligrams per kilogram (mg/kg), respectively. Copper was detected in soil samples in Wells I-3 and I-4 at concentrations up to 6,300 mg/kg.

PCBs were detected in only one soil sample. This sample, from a depth of 1.5 feet in the Well I-4 boring, contained PCBs at a concentration of 89,500 μg/kg.

Gross alpha and gross beta analyses of soil samples did not indicate an acute health hazard (*EMCON, 1987a*). However, the data were not sufficient to determine if the radioactivity detected was natural background or manmade.

Ground-water samples were collected from each monitoring well and analyzed for VOCs, SOCs, priority pollutant metals, and gross alpha and beta radioactivity. VOCs were detected at concentrations between 4 and 250 micrograms per liter (μg/l) in samples from Wells I-1, I-2, I-3, I-4, I-5, and I-6. Well I-4 contained the widest variety of VOCs, including the highest concentrations for most compounds. SOCs were detected in all wells except Well I-9, with Wells I-3, I-4, and I-5 containing the greatest number of compounds at the highest concentrations. Thin films, presumably organic, were detected on the ground-water surface in Wells I-2, I-4, and I-8. Priority pollutant metals were detected in samples from all wells with concentrations ranging from non-detectable to 1.3 ppm. In six of the wells, electrical conductivity of the ground water ranged from 3500 to 6000 micromhos per centimeter (μmhos/cm). In Wells I-7, I-8 and I-9, the conductivity ranged from 28,000 to 47,000 μmhos/cm, perhaps indicating a greater tidal influence.

Water levels in the nine monitoring wells have been measured but provide inconclusive information regarding ground-water flow directions because the effects of tides and other factors that may affect water levels have not been investigated.

Four transects using very low frequency electromagnetic equipment and five transects using a magnetometer were run across selected areas of the site to search for buried metal objects and to identify the depth and lateral extent of the landfill material. The results of these surveys suggest that buried metal objects are common in the landfill, although their size and depth could not be determined. In a few areas, the lateral limits of the landfill were apparently approximately located.

The proposed RI field investigation at the Industrial Landfill is designed to assess the extent of hazardous materials in the soils and ground water beneath the site and to evaluate the potential for chemical-bearing ground water to migrate into the bay. Surface geophysical techniques such as EM and GPR may be used to provide clearance for drilling and to supplement existing data on the areal extent of the landfill. The techniques to be used will be selected based on an evaluation of the results of the geophysical surveys conducted during the Verification Step (*EMCON, 1987a*). Gamma- and beta-sensitive field instruments will be used to scan the surface of the site for radioactivity. In addition, subsurface soils will also be scanned for radioactivity during drilling and trenching. If the scan produces positive results, then sampling and boring procedures will be adjusted to take the conditions into consideration. A survey of VOC concentrations in shallow soil gas may be conducted to aid in selecting the best locations for wells to be installed east of the site (downgradient, according to available water-level data). Trenches or test pits may be excavated to investigate the limits of fill materials.

Ten to fifteen shallow ground-water monitoring wells will be installed in the vicinity of the landfill. Because contaminants have been detected in the shallow ground water beneath the landfill, at least three monitoring wells will be completed in a deeper permeable unit. Forty to fifty test borings will also be drilled. Soil samples will be collected at about 5-foot intervals from the test and monitoring well borings, and at least two to four samples from each boring will be collected and analyzed for VOCs, SOCs, PCBs, total petroleum hydrocarbons (TPH), and priority pollutant metals. Ground-water samples will be collected from all existing and proposed wells and analyzed for TPH, VOCs, SOCs, and priority pollutant metals. An attempt will be made to collect samples of the film observed on the water surface in three wells. Sediment samples from off shore of the landfill may also be collected and analyzed.

A study of the influence of tides on water levels and ground-water flow directions will be conducted in conjunction with a short-term aquifer test to assess the hydraulic properties of the shallow aquifer. Air monitoring will be performed to evaluate the presence and concentrations of airborne contaminants.

3.2.2 Bay Fill Area, IR-2

The Bay Fill Area has been used as a disposal site for various wastes from the shipyard. The principal waste disposed has been identified as 237,000 tons of sandblast waste containing steel, copper, lead, and paint scrapings. The wastes disposed in the Bay Fill Area may also include sandblast waste from ships exposed to nuclear detonations in the Bikini Atoll (*Navy, 1982*); however, available data indicate that these radioactive wastes were disposed off site. Other wastes that were disposed in this area include chemicals, waste oils, building and ship materials, and acid tank roofs.

Twenty borings have been drilled in this area during two previous studies. Seventeen borings were drilled to a depth of about 12 feet for the Verification Step (*EMCON, 1987a*) and three borings were drilled to about 5 feet deep as part of the Area Study (*EMCON, 1987b*). Five of the deeper borings were completed as monitoring wells. Soil samples were collected from each of the borings and ground-water samples were collected from each of the monitoring wells. Water levels ranged from 4 to 10 feet below ground surface.

Soil and water samples from the Verification Step were analyzed for VOCs, SOCs, and selected metals (lead, chromium, copper, tin, and zinc). Eleven soil samples from seven borings were analyzed for asbestos. Composite soil samples from the Area Study were analyzed for VOCs, SOCs, selected metals, and TPH.

Organic compounds were detected in soil samples from each of the borings. Concentrations ranged from non-detectable to several milligrams per kilogram (mg/kg).

The only significant concentrations of VOCs were found near the surface in a boring on the western side of the Bay Fill Area, and consisted mostly of tetrachloroethene (PCE) at a concentration of 620 μg/kg. Concentrations well above detection limits were found for some SOCs in almost all of the borings. PCBs were found in one of the composite soil samples from the Area Study, at a concentration of 263 mg/kg (hexachlorobiphenyls).

Tin was the only metal not found in any of the soil samples. While concentrations of other metals were commonly highest at the surface and lowest at depth, several reverse trends were also noted. Copper and zinc in soil samples from one boring were detected at 37,000 and 2,200 mg/kg, respectively; however, a follow-up investigation (*HLA, 1987*) showed that these concentrations appeared to be isolated occurrences. Asbestos was found at concentrations of between 1 and 2 percentin four borings.

Ground-water samples contained no detectable VOCs, and only one well had detectable priority pollutant SOCs (a trace of naphthalene). Samples from Well B-3 also contained some non-priority pollutant SOCs that were not be specifically identified.

The initial step of the proposed field investigation will be to use surface surveying methods to clear the site for drilling and sampling. Gamma and beta-sensitive field instruments will be used to scan the surface of the site for radioactivity. In addition, subsurface soils will also be scanned for radioactivity during drilling and trenching. If the scan produces positive results, then sampling and boring procedures will be adjusted to take the conditions into consideration. Surface geophysical methods (EM and GPR) may be used to evaluate the depth and lateral distribution of fill and to locate buried objects. Trenches or test pits may be excavated to investigate the limits of fill materials.

Several point sources exist within the Bay Fill Area. These sources are indicated either by data from previous investigations or by data developed by the DA (Triple A sites). As a result, test borings and/or monitoring wells will be more closely spaced in those areas. Ninety to one hundred test borings will be drilled within the Bay Fill Area. Of these borings, at least ten will be completed as monitoring wells to facilitate collection of ground-water samples, measurement of floating product, and measurement of water levels. Because contaminants have been detected in the shallow ground water, a minimum of three deeper wells will be installed. In each shallow test boring, soil samples will be collected at intervals not to exceed 5 feet. Ground-water samples will be collected from new and existing monitoring wells. Soil and ground-water samples will be analyzed for TPH, VOCs, SOCs, priority pollutant metals, and PCBs. Aquifer tests and tidal influence studies will be conducted to gain information on the hydraulic characteristics of HPA and the Bay Fill Area. Air monitoring will be performed to assess the quality of the air at the site. Sediment samples will also be collected from intertidal areas adjacent to the Bay Fill Area.

3.2.3 Oil Reclamation Ponds, IR-3

In 1944, two Oil Reclamation Ponds were constructed on the south shore of the Bay Fill Area. These unlined ponds were used to store waste oil generated by ships and the industrial shops. In addition to hydrocarbons, wastes including bilgewater, solvents, caustic soda, ethylene glycol, and chromates were apparently placed in the ponds. The waste oil was heated to remove water and the reclaimed oil was removed from the ponds about three times a year by a contractor. In 1974, the ponds were filled with soil; cleanup of underlying soils apparently did not occur. Sandblast waste was also allegedly disposed over the ponds by Triple A and the area shows signs of such recent activity.

Five borings were drilled at the site in 1986 for the Verification Step of the Confirmation Study (*EMCON, 1987a*). Two of these borings were drilled within the boundaries of the old ponds. Three borings were drilled just beyond the pond perimeters and were converted to monitoring wells. A total of 15 soil samples was collected from the borings at depths ranging from 0.5 to 11 feet. Soil and water samples were analyzed for VOCs, SOCs, and selected metals (chromium, copper, lead, zinc, and tin). Water levels ranged from 7 to 10 feet below ground surface. A surface geophysical survey of the area using a magnetometer revealed buried metallic objects within the old ponds.

All soil samples contained visible oil, and chemical analysis revealed the presence of petroleum hydrocarbons and PCBs. All soil samples contained chromium, copper, lead, and zinc. Tin was detected at a depth of 6 feet in one boring. The vertical distributions of copper, lead and zinc varied considerably between borings.

Analyses of the water samples showed VOCs and SOCs slightly above detection limits in all of the wells. Over 2 feet of floating petroleum product was observed in one well, and a thin film of product was detected in a second well.

The proposed sampling program is designed to assess the lateral and vertical extent of contamination from the Oil Reclamation Ponds. Initially, appropriate surface geophysical techniques, such as EM and GPR surveys, will be used to define the areal extent of the ponds and to provide clearance for drilling.

Approximately 15 to 20 borings will be drilled within and around the ponds. Soil samples will be collected at several depths in each boring and at least three of the borings will be completed as monitoring wells for collecting ground-water samples and measuring thicknesses of floating product. Up to three deep monitoring wells will be installed to assess whether contaminants present in the shallow ground water have migrated into deeper zones. The monitoring wells will also be used to provide information on tidal influence and on ground-water and product gradients. Trenches and/or test pits may be excavated to define the limits of migration of oily wastes. Soil and water samples will be tested for VOCs, SOCs, TPH, PCBs, oil and grease (O&G), and priority pollutant metals. In addition, air monitoring will be performed to assess the presence of airborne contaminants. To assess the potential for biodegradation of contaminants in the soils, samples will also be collected for microbiological analysis. Sediment samples may be collected from off shore of the ponds.

3.2.4 Scrap Yard, IR-4

From 1954 to 1974, used submarine battery lead and copper, as well as used electrical capacitors containing PCBs, were stored at the HPA Scrap Yard. According to the IAS, approximately 7000 pounds of lead and copper residue are estimated to have been washed into the soil during this period and 250 gallons of oil containing PCBs from crushed capacitors may have been spilled on site.

Soil samples were collected from eight borings drilled to a maximum depth of 6 feet. Two to four soil samples were collected from each boring and were analyzed for PCBs and total and soluble metals (lead, copper, arsenic, and zinc). Soil samples from three borings were also analyzed for asbestos. The highest levels of copper (420 mg/kg), lead (47 mg/kg), zinc (220 mg/kg), and arsenic (3.9 mg/kg) were detected in the soil above 3 feet in two borings near the southwestern corner of the site. Ground water was not encountered in any of the borings drilled in the Scrap Yard; depth to water in the area is expected to be approximately 7 to 10 feet below ground surface.

Concentrations of PCBs were below 10 mg/kg in five out of the six samples in which PCBs were detected. One sample contained PCBs at 13 mg/kg. Chrysotile asbestos was detected in soil samples from three borings at concentrations between 3 and

34 percent; however, much of the fill at this site is serpentinite, which contains naturally occurring asbestos.

Proposed work at the Scrap Yard is designed to assess the extent of metals and PCBs near the southwestern corner of the site where elevated concentrations have been detected, to evaluate the presence of metals and PCBs in shallow ground water, and to evaluate the ground-water flow direction. A minimum of ten soil borings will be drilled to depths of 10 to 15 feet. Because the potential contaminants are not expected to be very mobile, soil sampling will be more frequent in the shallow soils. Samples will be collected near ground surface and at depths of 2.5, 5, and 10 feet (also at 15 feet when attainable). Samples will be analyzed for all priority pollutant metals and PCBs. At least three of the borings will be completed as monitoring wells and will be sampled. A deep well will also be installed and sampled. Ground-water samples will be analyzed for VOCs, SOCs, TPH, priority pollutant metals, and PCBs. Air monitoring also will be performed to assess the potential for airborne contaminants.

3.2.5 Old Transformer Storage Yard, IR-5

Used electrical transformers were stored in an unpaved, open yard from 1946 to 1974. The transformers were periodically hauled off site by a contractor. Although there are no records or reports of transformer oil spills, it is likely that some old transformers leaked PCB-contaminated oils. The exact lateral extent of the Storage Yard is not known.

Twenty-one borings, spaced on approximately 50-foot centers, were previously drilled at the site. One soil sample was collected from each boring, at depths ranging from the surface to 2 feet. Soil samples were analyzed for PCBs. PCBs were detected in six samples, generally in the western and southern portions of the site. One sample contained a concentration of 15 mg/kg PCBs, while the other five samples contained less than 10 mg/kg. Ground water was encountered at a depth of 5 feet at one boring but a ground-water sample was not collected.

The proposed additional work is designed to investigate the extent of PCB contamination in soils to the southwest, where higher concentrations may be present. Additional work is also needed to assess the presence of PCBs in the shallow ground water and to determine the direction of ground-water flow. Approximately 10 to 15 test borings will be drilled to a depth of about 10 feet, extending the previous sampling grid pattern to the west and south by approximately 100 feet in each direction. Samples will be collected at about 2.5-foot intervals in the test borings and will be analyzed for priority pollutant metals and PCBs. Air monitoring will be performed to assess the potential for airborne contaminants.

To evaluate ground-water conditions, three shallow monitoring wells and one deep well will be installed. Ground-water samples will be analyzed for TPH, VOCs, SOCs, priority pollutants metals, and PCBs.

3.2.6 Tank Farm, IR-6

The Tank Farm has been in use since 1942. Ten storage tanks are currently in use for the storage of diesel and lubricating oil. These include one 4384-barrel (about 240,000 gallons) tank and nine 286-barrel (about 15,000 gallons) tanks. Oil spills have apparently occurred at the site and the ground surface is stained. In 1944 there was a reported release from a ruptured 286-barrel tank. The released hydrocarbons apparently flowed beyond containment berms surrounding the tank.

The previous investigation was limited to visual examination of the soils at the surface and collection of soil samples at shallow depths of 8 to 12 inches using a hand shovel. The samples were visually examined and petroleum-like odors were noted. Samples were not submitted for chemical analysis. The results of the investigation indicated that oil staining was present in the top 1/2-inch of soil. Deeper soils were not stained, but to the depths explored, soils reportedly had a strong petroleum-like odor.

This area will be investigated to evaluate the presence of petroleum hydrocarbons that may have been released from the tanks. It is anticipated that access will be facilitated by interim removal actions planned for this area. A geophysical survey will be performed to locate buried pipelines and other utilities. Approximately 10 to 15 soil borings to about 10 to 15 feet deep will be drilled in this area. It is anticipated that at least three of the borings will be converted to monitoring wells. Soil samples will be collected at hydrogeologic or hydraulic interfaces, including, but not limited to, the ground surface, the water table, the bottom of the fill, and the top of the bay muds (if encountered). The sampling interval in the unsaturated zone will not exceed 5 feet. Additional soil samples may be collected based on conditions encountered during drilling.

The depths of the monitoring wells will be determined in the field following collection of hydrogeologic data. At least three shallow monitoring wells will be installed. The wells will be located around the Tank Farm to permit calculation of hydraulic gradients and will be constructed to facilitate the detection of floating product on the water table. Because of the proximity of the bedrock at the ground surface, it is anticipated that bedrock underlies the site at a relatively shallow depth. At least one well will be completed in a deeper zone, if present. Ground-water samples will be collected from all wells.

Soil and ground-water samples will be analyzed for TPH, benzene, toluene, xylenes, ethylbenzene, and O&G.

3.2.7 Sub-Base Area, IR-7

The Sub-Base Area includes the Painting Area, the Sandblast Fill Area, and the Additional Area. These three areas will be collectively referred to as the Sub-Base Area. The Painting Area was used for painting submarine superstructures. The paints used were zinc chromate-based and there is evidence that some paint was spilled on the ground surface. In addition, diesel fuel spills may have occurred during painting of submarine fuel lines. The Sandblast Fill Area, and to a lesser extent the Additional Area, were used as disposal sites for sandblast wastes generated from the Painting Area. The sandblast wastes contain metals, paint scrapings, and possibly, although unlikely, radioactive material from decontamination of naval vessels exposed to nuclear detonations near the Bikini Atoll (*Navy, 1982*).

A total of twelve borings and six wells has been drilled in the three areas. Fifty-four soil samples and six water samples were collected and analyzed for VOCs, SOCs, gasoline, and diesel fuel. Selected soil and ground-water samples were also analyzed for metals and asbestos. Water levels ranged from 7 to 15 feet below ground surface.

Trace levels of organic chemicals, both VOCs and SOCs, and diesel fuel were detected in soil samples from all three areas. Concentrations of most metals ranged from non-detectable to about 10 mg/kg, with the exception of chromium, copper, lead, nickel, and zinc, which ranged from 10 ppm to 7,200 ppm. The elevated chromium and nickel concentrations may be due to serpentinite-derived soils, which are naturally high in these metals.

Ground-water samples, limited to the Painting and Sandblast Fill areas, had no detectable levels of VOCs, SOCs, or petroleum products. The concentrations of metals in all the water samples ranged from non-detectable to about 1 mg/kg with the exception of antimony, which was detected at concentrations up to 1.8 ppm.

Because of the nature of the fill materials known to have been distributed across the site and the possibility that some of the materials may be radioactive, two methods of examination will be used to clear the site for drilling and sampling. Surface geophysical surveys, specifically EM and GPR, will be used to examine the depth and lateral distribution of fill and also to evaluate the presence of buried metallic objects. Field instruments will be used to scan the surface of the site for any radioactivity. A preliminary site screening should identify whether any surface radioactivity exists. If the scan produces positive results, the sampling and boring procedures will be adjusted to take this condition into consideration and sampling will be necessary to identify the type, level, and extent of the radioactive contamination.

The purpose of the proposed field investigation is to further characterize the low-level contamination detected at the site and to provide additional data on the quality and characteristics of the ground water. It is anticipated that 15 to 20 borings will be drilled to depths of 10 to 20 feet. At least five of these borings will be completed as shallow monitoring wells. Ground-water samples will be collected from the monitoring wells and a tidal influence study will be performed. Because contaminants have been detected in the shallow ground water, at least three deeper wells will be installed. Soil and ground-water samples will be analyzed for VOCs, SOCs, priority pollutant metals, and TPH.

3.2.8 Building 503 PCB Spill Area, IR-8

The Naval Public Works Department located a suspected PCB spill during repair of a buried utility line east of former Building 503. The suspected sources of the PCB contamination are a nearby transformer pad and transformers on two power poles southeast of the area. Building 503 does not appear to be the PCB source because it was the base laundry.

Four episodes of sampling and analysis have occurred, including field and/or laboratory analysis of PCBs. The 7 borings completed as monitoring wells were drilled to depths of 15 to 20 feet, while 65 other borings were drilled to depths of 5 to 6 feet. Some of these wells have since been plugged and destroyed because of construction activities. All soil samples were analyzed for PCBs. Two soil samples were also analyzed for trichloroethylene (TCE) and 1,1,1-trichloroethane (TCA). Depth to ground water in the monitoring wells ranges from 4.5 to 7.5 feet. Ground-water samples were collected from the seven monitoring wells.

The highest levels of PCBs (up to 910 mg/kg) were encountered east of Building 503 between the transformer pad and Hussey Street. In addition, low concentrations ($\leq$5.6 mg/kg) were found at four locations within 320 feet of the transformer pad. Some of the ground-water samples contained PCBs at or near the detection limit. The two samples analyzed for TCE and TCA contained no detectable levels of these compounds.

The Navy has excavated PCB-containing soil in this area to depths of 3 to 6 feet. The excavation has been designed to remove soil containing greater than 25 mg/kg of PCBs. A total of about 1,255 cubic yards of soil has been excavated to date. Additional soil excavation is planned.

Additional clearing samples are still to be collected and, if available, these data will be evaluated for the final sampling plan. Additional work for the RI will evaluate the lateral and vertical extent of PCB contamination outside the area of excavation. Additional borings will be drilled to sample soils beneath and adjacent to the excavation. Ten to fifteen borings will be drilled to a depth of about 25 feet. Soil samples will be collected at the surface, 2.5 feet, and 5 feet and at 5-foot intervals thereafter, although soil samples will not be collected within the limits of the excavation where imported backfill has been placed. At least five shallow monitoring wells and one deep monitoring well will be installed. Ground-water samples will be collected from existing and all newly-installed monitoring wells. Soil and ground-water samples will be analyzed for PCBs. Selected samples may also be analyzed for VOCs, SOCs, TPH, and O&G. The influence of tides on water levels in the monitoring wells will also be evaluated. Additionally, air monitoring will be performed to assess the potential for air-borne contaminants.

3.2.9 Pickling and Plate Yard, IR-9

The Pickling and Plate Yard was used for industrial metal finishing and painting activities between 1947 and 1973. Three empty acid storage tanks, three empty open (brick-lined) dipping pits, and an open plate storage rack are present at the site. Steel plates were placed on the storage rack and sprayed with zinc chromate primer. Asphalt or concrete appears to underlie these facilities and covers most of the ground surface in the area.

Chemicals used at the site included zinc chromate, sodium dichromate, and sulfuric and phosphoric acids. Prior to separation of a combined sewer system in 1977, approximately 15,000 gallons of acid-contaminated rinse water was discharged to the combined sanitary/storm sewer system each month. Acid and zinc chromate residues coat most of the structures in this open pickling yard. Available data are limited to analyses of the residue and liquids; no soil or ground-water data are available.

A geophysical survey will be conducted to locate buried pipelines and other utilities. Ten to fifteen borings will be installed to investigate for low-pH soils and heavy metal contamination in the area of the pits and the open storage rack. One of the borings may extend to bedrock to obtain facility-wide data. If possible, borings will also be installed beneath or adjacent to the dipping pits. Sampling locations are dependent on access and on planned interim removal measures (Section 2.6.3). Soil samples will be collected immediately beneath the concrete and at least every 2.5 feet until ground water is encountered. At least four shallow and two deep monitoring wells will be installed to permit collection of ground-water samples. The shallow wells will be located to permit calculation of hydraulic gradients.

Soil and ground-water samples will be analyzed for pH and heavy metals. Selected samples will also be analyzed for TPH, VOCs, and SOCs.

3.2.10 Battery and Electroplating Shop, IR-10

From 1946 through 1974, Building 123 was used for electroplating and battery storage and maintenance. Waste acids containing heavy metals (mostly copper and lead), cyanide wastes, and chromates were reportedly spilled onto the floor of the building and in the dock loading area (*WESTEC, 1984*). Spilled liquids drained into floor drains, and into the storm sewer systems which discharged into the bay.

In 1986, 18 samples of residue from the building floor were collected and analyzed for selected metals. Twelve of these samples were from the battery shop and six were from the electroplating shop. In addition, one air sample was collected inside the building. No soil or ground-water samples were collected.

The floor scrapings from the battery shop contained cadmium and lead at concentrations up to 150 and 45,000 mg/kg, respectively; copper was present at concentrations up to 2,400 mg/kg. The air sample was analyzed for total particulates and selected metals. Low levels of metals were detected in the air sample.

Investigation at this site will include soil and ground-water sampling to evaluate whether chemicals have been released to the subsurface. Approximately 10 to 15 borings will be installed in the vicinity of Building 123. The borings will extend to at least the ground-water surface. Soil samples will be collected, starting at the ground surface and continuing at least every 5 feet thereafter. Additional soil samples may be collected, including in the building, based on conditions encountered during drilling. At least one deep and three shallow monitoring wells will be installed to permit collection of ground-water samples. These wells will be located to permit calculation of hydraulic gradients in the shallow aquifer zone. Soil and ground-water samples will be analyzed for pH, metals (including hexavalent chromium), and cyanide. Some of the samples will also be analyzed for VOCs, SOCs, TPH, and O&G.

3.2.11 Building 521 Power Plant, IR-11

Building 521, located at the southern end of the HPA, housed a high-pressure boiler used to generate electricity from 1950 to 1969. The principal suspected contaminant is asbestos used as insulation for the steam generation system and present in a 400- to 500-pound mound of insulation found outside the building. Other possible sources of contaminants are barrels of xylenes, paint, and metal conditioner stored on a concrete pad outside the plant.

The previous investigation was limited to air monitoring for asbestos. No asbestos fibers were detected and the concentration of other fibers greater than 5 micrometers (μm) was considerably less than OSHA regulations (*EMCON, 1987a*).

The proposed investigation will address the presence of asbestos and the paint and solvents found in barrels outside the building. The scope and area of investigation may change depending upon current exploration being performed adjacent to Building 521 (Section 3.2.13, Site PA-15). Additional exploration will occur following cleanup operations outside the building.

Soil samples will be collected from the ground surface to a depth of about 1 to 2 feet at 10 to 15 locations to evaluate whether contaminants are present at the surface in the vicinity of the Power Plant. In the areas where the drums were stored, at least two borings will be drilled to depths of 10 to 15 feet. At least one deep and three shallow monitoring wells will be installed to permit collection of ground-water samples and calculation of hydraulic gradients. Soil samples will also be collected in the well borings. The soil samples will be collected at and just below the ground surface and then at least every 5 feet thereafter. Depending on site conditions, additional samples may be collected. Ground-water samples will be collected from the wells.

All samples will be analyzed for asbestos, VOCs, TPH, O&G, and PCBs. The type of asbestos will be determined, if possible.

3.2.12 Triple A Sites

In addition to the above described IR sites, several Triple A sites have been identified by the DA as discussed in Section 2.3.2. Descriptions of these sites are presented in Table 5; their locations are shown on Plate 2. Some of these Triple A sites are within the IR sites and exploration will be conducted at these sites as part of the RI field work. PA/SIs are planned or are currently being performed by the Navy on the remaining Triple A sites, with the exception of Triple A Site 8 as discussed below. These remaining Triple A sites have been designated as PA sites. Where appropriate, several Triple A sites have been combined into a single PA site based on location and the nature of alleged disposal occurring at the site. The following descriptions of the Triple A sites are based on information from the DA's investigation.

- PA-12 includes Triple A Sites 3 and 4 bounded by 6th Avenue, Spear Avenue, and "J" Street where liquid and solid wastes were allegedly disposed in a trench and oil and chemicals were allegedly disposed into a storm drain.

- PA-13 includes Triple A Sites 5 and 15 which are near Manseau and I streets where sandblast waste and drums containing liquids were reportedly stored on a concrete pad. These materials have since been removed.

- PA-14 includes Triple A Sites 6 and 7 which are unpaved areas southwest of H Street where a Triple A tank truck was observed discharging oily wastes onto the ground surface. Salvage waste was also reportedly dumped and covered with sand. Barrels were reportedly stored in this area, but have since been removed.

- PA-15 includes Triple A Sites 12 and 13 which consist of three areas in the vicinity of Building 521 where oily waste was allegedly discharged onto the ground surface.

- PA-16 includes Triple A Site 9 which is an old transformer lot at the corner of 11th and Mahan streets where a barrel containing old rags and other old barrels and cans were stored. The barrel containing old rags was labelled "PCBs" and has been removed.

- PA-17 includes Triple A Sites 10 and 11 and is located adjacent to Berth 29 near the end of "H" Street where barrels of possibly PCB-contaminated oil were allegedly stored.

- PA-18 is an unnumbered Triple A site near the corner of Earl Street and Innes Avenue where 80,000 to 100,000 gallons of waste oil were reportedly discharged onto the ground surface

It is anticipated that these, as well as other, Triple A sites may be added to the RI, and specific sampling plans will be prepared, as appropriate.

Triple A Site 8 has been investigated as part of the area study (EMCON, 1987b) and the PCB site characterization investigations (ERM-West 1986a, b, and 1987b). Based on the findings of these studies, a portion of this site has been the focus of a removal action to mitigate PCB soil contamination and has been added to the RI/FS investigations as IR-8. No contamination was detected on the remainder of the site with the exception of surface asbestos-containing-material (ACM) left by Triple A when it demolished Building 503 in 1981. The ACM was collected, packaged and disposed in an approved landfill by the Navy in March 1987. With the exception of IR-8, no additional action was warranted on the remaining portion of Triple A Site 8. IR-8 will be further characterized as discussed in Section 3.2.8.

3.2.13 Other Areas

Preliminary investigations have been performed over much of the area at HPA. The areal coverage of these investigations is shown on Plate 2. For the purposes of the

RI and this document, the shipyard has been subdivided into the following irregular sections.

- o NACIP (IR) sites (IR-1 through IR-11)
- o Triple A sites outside the NACIP sites (PA-12 through PA-18)
- o Other Areas (areas outside the IR and PA sites)

The NACIP (IR) sites include those that were discussed in the Verification Step (*EMCON, 1987a*) and the Building 503 PCB Area (*ERM-West, 1986a, 1986b, and 1987b*). These areas are to be further investigated as described in Sections 3.2.1 through 3.2.11. PA/SIs are planned or are currently being performed by the Navy at Sites PA-12 through PA-18 as described in Section 3.2.12.

The Navy will perform a comprehensive investigation for the Other Areas. The primary objective of this investigation is to identify and assess the possible presence of contaminants in the Other Areas. In general, the approach that the Navy will follow will be consistent with the EPA's PA/SI guidance; however, the objective of this PA/SI is not to rank the site for possible inclusion on the National Priority List (NPL). Rather, the purpose will be to identify areas that require some level of field investigation to assess the presence of contaminants in the soil and ground water.

The Navy will initiate this investigation by performing the equivalent of a PA, including:

- o interviewing former Navy employees who worked at HPA
- o examining Navy records describing
  - building and land use,
  - chemical use, storage, and disposal,
  - information used to prepare the IAS.

- o examining additional data that may become available because of other ongoing Navy studies at HPA.

The information will be evaluated to define those areas on site where contamination is not likely to exist. In these areas, no further field investigation will be performed. These areas may include areas where land or building use studies show it is unlikely that contaminants would be present. Examples may include buildings where no chemicals were handled, or broad areas of pavement (where it is unlikely that illegal disposal occurred). The descriptions and justifications for these areas will be presented in reports separate from those which address the IR and PA sites.

In those areas where the initial evaluation indicates the possible presence of contaminants, an SI will be performed. The objective of the SI is to gather additional site specific information, which may include, but not be limited to:

- o Site location and approximate area,
- o Type and quantity of contaminants or waste stored or disposed at site,
- o Potential hazards associated with the site,
- o Results of preliminary field sampling and chemical analysis (e.g., samples collected from sumps or the ground surface).

The results of the SI will be evaluated to determine where additional field sampling is warranted and those areas where cleanup activities such as debris removal are sufficient. Areas where further field investigation appears warranted will be added to the RI, and appropriate sampling plans prepared.

Additional ground-water monitoring wells will be installed at the shipyard to facilitate evaluation of the ground-water flow direction beneath the facility. Evaluation of this monitoring network will depend on data obtained during the RI field work.

3.3 RI Report

At the completion of the RI field investigation, an RI report will be prepared for that site or group of sites in accordance with applicable EPA guidance documents (*EPA, 1985b*). The report will include, but not be limited to, the following items.

- Description of the site (location, demography, land use, geology, hydrology, climatology, history)
- General description of the extent of contamination
- Description of chemical and waste materials used and disposed
- Summary of previous investigations
- Description of field work performed
- Discussions of hydrogeologic and other media-specific conditions
- Description of the contaminants found in all medium
- Description of the lateral and vertical extent of contamination
- Recommendations for additional work, if required

Depending on the data developed during the RIs, it is likely that the sites will be combined into groups as previously discussed and RI reports may be prepared for each of the groups. The RI reports will be submitted to the regulatory agencies for review and comment.

4.0 PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION

A Public Health and Environmental Evaluation (PHEE) will be performed to develop health-based and environmental performance goals for remedial alternatives at HPA. The principal elements of the PHEE are hazard identification, dose-response assessment, exposure assessment, and risk characterization. The tasks to be performed will be detailed in a Public Health and Environmental Evaluation Plan (PHEEP). Appendix G of Volume II is a summary of the Preliminary Public Health and Environmental Evaluation (PPHEE) currently being prepared by the Navy (ATT, in preparation). The PPHEE will provide an assessment of the current potential human and environmental threats posed by the identified sites at HPA.

Based on existing information and on data developed during the RIs, a PHEE will be performed following guidelines included in the following documents: 1) Superfund Endangerment Assessment Handbook (*EPA, 1985c*); 2) Superfund Public Health Evaluation Manual (*EPA, 1986a*); 3) Superfund Exposure Assessment Manual (*EPA, 1986b*); and 4) Toxicology Handbook (*EPA, 1985d*).

The PHEE will comprise a public health evaluation and an environmental assessment of chemicals found at each of the sites. Indicator chemicals, which will be used to represent carcinogenic and non-carcinogenic risk at the sites, will be identified. Because of the sensitive environmental setting of HPA, fate and transformation processes will be considered in selecting indicator chemicals. Potentially exposed receptor populations will then be identified. These receptor populations may include humans and both pelagic and benthic species found in San Francisco Bay.

A dose-response assessment will be made to include animal-to-human extrapolation, duration extrapolation, and route extrapolation. The route extrapolation will include air, soil, ground-water, and surface-water media. Attention will also be given to the bay sediments because aquatic species may be exposed to chemicals in the sediments. Using appropriate exposure scenarios, a toxicological assessment will be made of potential carcinogenic and non-carcinogenic effects of the site indicator chemicals. Environmental effects assessments will also be developed. Based on the above information, the risks to potentially exposed receptor populations caused by each indicator chemical will be characterized.

The results of the PHEE will be summarized in a report that will include but not be limited to: 1) existing and new data, 2) the hazard identification of chemicals found at the sites, 3) identification of routes of exposure in the various media, 4) development of exposure scenarios for potentially exposed receptor populations, and 5) characterization of potential risks to humans and the environment. The PHEE report will be submitted to the regulatory agencies for review and comment.

5.0 FEASIBILITY STUDIES

5.1 Overview

It is anticipated that a Feasibility Study (FS) will be required for all IR sites where the Remedial Investigation (RI) indicates the presence of a threat to human health or the environment sufficient to warrant remediation. The FS will be conducted in accordance with EPA's "Guidance on Feasibility Studies Under CERCLA" (*EPA, 1985e*) and the appropriate California Administrative Code sections. Because at least four RI groups are planned (see Section 1.1), it is most likely that at least four FS reports will be prepared, one for each group of IR sites. However, it is also conceivable that these groups may be changed to facilitate the FS process. For each IR site, HLA plans to perform an initial screening of remedial technologies as the first step in the FS as discussed in the following section.

5.2 Initial Screening of Remedial Technologies

Using data from previous investigations and data developed during the RIs and PHEE, an initial screening of remedial technologies will be performed for each IR site. The objective of this screening will be to identify those remedial technologies that are not feasible or applicable to the HPA sites and can therefore be eliminated from further consideration in developing remedial action alternatives. In eliminating those technologies that are infeasible or difficult to implement, the initial screening will consider both source control measures and management of contaminant migration. Site conditions, waste characteristics, level of technology development, and reliability will also be considered.

As outlined in the National Contingency Plan (*EPA, 1985a*), the scoping phase of the RI includes review of available information to determine the type(s) of remedial response actions that may be needed to remedy potential site problems. Table 11 summarizes the range of response actions and associated remedial technologies as presented in EPA guidance documents for the RI/FS process (*EPA, 1985b and 1985e*).

Existing data indicate that the potential contaminant pathways are diverse and may include but not be limited to:

1) Airborne particulates
2) Surface-water infiltration
3) Leachate generation to ground water and bay water
4) Gas migration
5) Wastes in drums
6) Contaminated soils and sediments.

Because of the diversity of conditions and potential problems at HPA, few response actions listed on Table 11 can be eliminated at this time. The only response action that appears inapplicable is the development of an alternative water supply; the HPA facility and the surrounding area currently receive water from off-site municipal systems. However, examination of the data on a site-by-site basis may indicate that other response actions can be eliminated. As the RIs proceed and additional data are gathered, the range of general response actions may be reduced or revised.

As discussed in Section 5.1, the FSs will probably be separated into the same IR groups as the RIs. Results of the technology screening will be presented in a separate report for each of these groups and submitted to the regulatory agency review and comment. The reports will include, but not be limited to, the following:

- Description of each site

- Description of applicable remedial response actions and associated technologies
- Description/rationale for the screening process and the infeasibility of certain technologies
- Description of feasible technologies to be used in developing remedial action alternatives.

The reports will be prepared in conjunction with the RIs; each will be issued shortly after its associated RI report is submitted for agency review and comment.

5.3 Development of Remedial Action Alternatives

Upon completion of the initial screening of remedial technologies for an IR site and receipt of comments from the regulatory agencies, applicable technologies will be combined to form remedial action alternatives. The alternatives will be screened for public health, environmental, and cost factors. Those alternatives that pass the screening will be subjected to detailed technical, institutional, public health protection, environmental impact, and cost evaluations. The results of the screening and evaluations will be presented in a feasibility study report for each IR site and will include a selection of the best remedial action alternative. The details of implementing this process will be provided in a Feasibility Study Plan.

6.0 COMMUNITY RELATIONS PROGRAM

The first task in the community relations program will be preparation of a Community Relations Plan (CRP). This CRP will address issues of public concern regarding contamination at HPA and describe techniques for community participation throughout the RI/FS and the subsequent remediation. To obtain information necessary to formulate the CRP, several initial steps are planned. These steps are described in detail in a Work Plan for the CRP (*HLA, 1987b*) and will include interviewing community group leaders and community members using a prepared interview guide, preparing a preliminary mailing list, preparing a newsletter, and conducting several informal community meetings with specific community members, public officials, and/or environmental groups. Information obtained from these tasks will be used to develop a program for ongoing community relations. The community's concerns and comments will be incorporated, to the extent possible, and the program will be described in the CRP.

It is the Navy's intent that the community relations program will be formulated and operated by the Navy, with assistance from HLA. Input and assistance will be provided by both the Sacramento and Emeryville offices of DHS, the lead regulatory agency. The community relations program will be implemented throughout the RI/FS processes and subsequent remedial activities such that the public will be kept informed at all stages of the work at HPA.

7.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Plate 10 illustrates the project organization. The responsibilities of key project individuals are as follows:

- HLA Project Manager: Responsible for project coordination among HLA, the Navy, and regulatory agencies. Responsibilities include schedule and budget management, technical oversight, overall project quality, and report preparation.

- Technical Consultants: Responsible for providing technical direction and review of field programs, and for analyzing and reporting project data.

- Project Quality Control Officer: Responsible for ongoing review, monitoring, auditing, and evaluation of the field and laboratory QA/QC programs. Also responsible for development and supervision of QA/QC procedures for data management and analysis and report preparation and review.

A more detailed discussion of the project's organization and responsibility of individuals will be presented in the Project Management Plan.

8.0 SCHEDULE

Plate 11 presents the preliminary schedule for completion of the RIs, the PHEE, and the initial screening of remedial technologies. This schedule is based on a number of factors which include: 1) review of this draft Scoping Document by the Navy personnel within a maximum of one week of submittal, 2) review of this draft Scoping Document by the regulatory agencies within one month of submittal, 3) completion of the field investigation within three months, and 4) only one review period by the regulatory agencies. Changes in these assumptions and changes in the scope of the RIs as presented will affect the schedule. For example, the addition of currently unknown sites would increase the time required for evaluations and field investigations. Conversely the RI process could be expedited by factors such as shorter review periods, favorable conditions for the field work, and by combining field activities where possible. Additional data currently being generated will add to the understanding of the HPA sites and may expedite the analyses required during performance of the RI, the PHEE, and the initial technology screening.

The Navy plans to prepare quarterly scheduling updates to the regulatory agencies to inform them of the current status of the RI/FSs. This flexible schedule will be supplemented with verbal notification of scheduling changes, where necessary.

9.0 REFERENCES

Aqua Terra Technologies (ATT), 1988, Public Health and Environmental Evaluation Plan, Appendix A, Preliminary Public Health and Environmental Evaluation, in preparation.

Bonilla, M.G., 1971, Preliminary Geologic Map of the San Francisco South Quadrangle and Part of the Hunters Point Quadrangle, California, United States Geological Survey Miscellaneous Field Studies Map MF-311, 1:24.000.

California Water Code, Section 13020, et seq. (Porter-Cologne Water Quality Control Act).

EMCON Associates, 1987a, Confirmation Study, Verification Step, Hunters Point Naval Shipyard (Disestablished), San Francisco, California, March 19, 1987, Contract N62474-85-C5501, 4 volumes.

EMCON Associates, 1987b, Area Study for Asbestos-Containing Material and Organic and Inorganic Soil Contamination, Hunters Point Naval Shipyard (Disestablished), San Francisco, California, July 2, 1987, Project 365-02.03, 2 volumes.

EPA, 1980, Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.

EPA, 1985a, Office of Solid Waste and Emergency Response, 40 CFR Part 300: National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, in Federal Register, Vol. 50, No. 224, Wednesday, November 20, 1985, Part II.

EPA, 1985b, Office of Solid Waste and Emergency Response, Guidance on Remedial Investigations Under CERCLA, June, 1985, EPA/540/G-85/002.

EPA, 1985c, Endangerment Assessment Handbook, Contract No. 68-01-7037.

EPA, 1985d, Toxicology Handbook, Principles Related to Hazardous Waste Site Investigations, Contract No. 68-01-7037.

EPA, 1985e, Office of Solid Waste and Emergency Response, Guidance on Feasibility Studies Under CERCLA, June, 1985, EPA/540/G-85/003.

EPA, 1986a, Office of Solid Waste and Emergency Response, Superfund Public Health Evaluation Manual, EPA/540/1-86/060.

EPA, 1986b, Superfund Exposure Assessment Manual, Contract No. 68-01-6271.

EPA, 1986c, Office of Solid Waste and Emergency Response, Community Relations in Superfund: A Handbook, OSWER Directive 9230.0-3A. October.

EPA, 1988, personal communication with Region IX Federal Facilities Coordinator, September 18 and 21, 1987.

ERM-West, 1986a, Hunters Point Naval Shipyard, PCB Investigation, November, 1986, Contract No. N62474-85-C-5627.

ERM-West, 1986b, Hunters Point Naval Shipyard, Preliminary Investigation of Possible PCB Spill.

ERM-West, 1987a, Hunters Point Naval Shipyard, Soil and Water Sampling near Proposed Galley, June, 1987, Contract No. N62474-85-C-5627.

ERM-West, 1987b, Investigation of PCBs in Soil and Ground water at the Hunters Point Site, January 21, 1987.

Harding Lawson Associates (HLA), 1987a, Subsurface Investigation, Proposed Galley, Hunters Point Naval Shipyard, July 30, 1987, HLA Job No. 2176,119.02.

Harding Lawson Associates, 1987b, Scoping Document, Community Relations Plan, Ex-Hunters Point Naval Shipyard, October 6, 1987, HLA Job No. 2176,129.02.

Lowney/Kaldveer Associates, 1972, Foundation Investigation, Water Pollution Abatement Facilities, Hunters Point Naval Shipyard.

Public Law 99-499 (October 17, 1986), Superfund Amendments and Reauthorization Act, Environment Reporter, Washington, D.C.: The Bureau of National Affairs, Inc., November 28, 1986.

Regional Water Quality Control Board, RWQCB, 1987, Letter to Commander Chris Guild, dated September 4, 1987, from Roger James, Executive Officer, RWQCB; requesting the Navy to develop a winterization program for HPA.

San Francisco District Attorney's Office, 1986, People of the State of California v. Triple A Machine Shop, Inc., et al (1986), Exhibits to Peoples Memorandum of Points and Authorities in Support of Temporary Restraining Order, Construction Trust, And Appointment of Receiver filed by Arlo Smith, District Attorney, et al in the Superior Court of the State of California in and for the City and County of San Francisco.

U.S. Department of the Navy, 1982, Letter to Mayor Diane Feinstein dated Feb. 11, 1982, from A.M. Sinclair, Rear Admiral, U.S. Navy, Deputy Chief of Naval Operations.

U.S. Department of the Navy, 1987a, Sample Plan for Area 2, PCB Contaminated Soil Removal, Hunters Point Naval Shipyard, San Francisco, California.

U.S. Department of the Navy, 1987b, Final EIS: Homeporting: Battleship Battlegroup/Cruiser Destroyer Group, 3 volumes.

WESTEC Services, Inc., 1984, Initial Assessment Study, Hunters Point Naval Shipyard (Disestablished), San Francisco, California, October, 1984, Contract No. N62474-83-C-6972.

TABLES

Table 1. Descriptions of IR Sites

IR Site No.	IR SITES Description
RI/FS Sites	
IR-1	Industrial Landfill and Triple A Sites 1 and 16
IR-2	Bay Fill Area and Triple A Sites 2, 13*, 14, 17, 18, and 19; excludes IR-3
IR-3	Oil Reclamation Ponds and part of Triple A Site 17
IR-4	Scrap Yard and Triple A Site 3 north of Spear Avenue
IR-5	Old Transformer Storage Yard
IR-6	Tank Farm
IR-7	Sub-Base Area
IR-8	Building 503 PCB Spill Area
IR-9	Pickling and Plate Yard
IR-10	Battery and Electroplating Shop
IR-11	Building 521 Power Plant
Potential RI/FS Sites	
PA-12	Triple A Sites 3 and 4 south of Spear Avenue
PA-13	Triple A Sites 5 and 15
PA-14	Triple A Sites 6 and 7
PA-15	Triple A Site 12 and part of Triple A Site 13
PA-16	Triple A Site 9
PA-17	Triple A Sites 10 and 11
PA-18	Un-numbered site behind Dago Mary's

* Lies partially outside Bay Fill Area

Table 2. Types of Wastes Potentially Present at IR Sites (WESTEC, 1984)

Site	Years of Operation	Materials Found or Disposed
Industrial Landfill, IR-1	1958-1974	21,000 gallons liquid chemical wastes 500 cubic yards asbestos 6000 pounds low-level radioactive radium dials and knobs 235,000 tons sandblast waste possibly containing 26,000 tons paint scrapings
Bay Fill Area, IR-2	mid 1940's-1978	237,000 tons sandblast waste containing steel, copper, lead and paint scrapings Chemicals Waste Oils Building and ship building materials Acid Tank Roofs
Oil Reclamation Ponds, IR-3	1944-1974	Waste Oil Bilgewater Solvents Caustic Soda Ethylene Glycol Chromates Sandblast waste
Scrap Yard, IR-4	1954-1974	7000 pounds lead and copper residue washed into the soil from used submarine batteries 250 gallons PCBs from used electrical capacitors
Old Transformer Storage Yard, IR-5	1946-1947	PCBs
Tank Farm, IR-6	1942-Present	Diesel Fuel Lubricating Oil

Table 2. Types of Wastes Potentially Present at IR Sites (WESTEC, 1984) (continued)

Site	Years of Operation	Materials Found or Disposed
Sub-Base Area, IR-7	---	Zinc Chromate based paint Diesel Fuel Sandblast wastes containing metals and paint scrapings
Building 503 PCB Spill Area, IR-8	---	PCBs
Pickling and Plate Yard, IR-9	1947-1973	Zinc Chromate Sodium Dichromate Sulfuric Acid Phosphoric Acid
Battery and Electroplating Shop, IR-10	1946-1974	Waste acids containing heavy metals (mostly copper and lead) Cyanide Wastes Chromates
Building 521 Power Plant, IR-11	1950-1969	Asbestos Xylene Paint Metal Conditioner

Table 3. Summary of Sources and Quantities of Chemicals from Industrial Activities (Westec, 1984)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials*	Method of Disposal
STRUCTURAL GROUP					
411	Shipfitting Shop -- pickling of structural steel, draining of rinse water tanks and chemical tanks	---	15,000 gal. water rinse tank once per month. Each 15,000 gal. chemical tank 4 times per year.	Chemical Solution Tanks (1) Sulfuric acid, sodium chloride, and inhibitor (2) Sodium dichromate and phosphoric acid	Combined sewer
411	Shipfitting Shop -- pickling of structural aluminum, draining of rinse water tanks and chemical tanks	3 gpm	7,500 gal. once per month	Chemical Solution Tanks (1) Wyandotte M.F. acid and Altrex cleaner (2) Wyandotte 2487 acid	Combined sewer
411	Shipfitting Shop -- sand blasting abrasive	1 gpm	190 tons per week	Spent blasting grit and sand containing paint, scrappings, rust (metal)	Bayfill, Landfill
MECHANICAL GROUP					
134	Machine Shop -- cleaning of engine parts, draining of chemical tanks and rinse tank	1 gpm	---	Chemical Solution Tanks (1) Penesolve 814 (2) Penestrip CR	Combined sewer
258	Pipe Cleaning Shop -- draining of chemical tanks and rinse	2 gpm	6,000 gal. per week	Chemical Solution Tanks (1) Muriatic acid (2) Sodium hydroxide (3) Sulfuric acid (4) Chromic acid (5) Sodium hydroxide and Penesolve 814 (6) Penestrip CR	Combined sewer
				Other Chemicals Used: Naconal powder, degreasing compound, Diesel oil	Landfill
231	Machine Shop -- cleaning facility	2 gpm	5,000 gal. rinse water once per week. 3,000 gal. chemical solution once per month.	Chemical Solution Tanks (1) Sulfuric acid - 1 (2) Phosphoric acid - 1 (3) Sodium hydroxide - 3 (4) Dichloro benzene - 2	Combined sewer

Table 3. Summary of Sources and Quantities of Chemicals from Industrial Activities (Westec, 1984) (continued)

Building No.	Description of Originating Process	Waste Quantities		Waste Chemicals and Materials*	Method of Disposal
		Continuous Average Flow	Periodic Discharge		
231	Machine Shop -- backwash from water demineralization plant, and boiler blowdown	2,000 gal. per month	3,000 gal. four times per month (anion softeners). 1,500 gal. seven times per month (cation softeners)	Anion softeners -- caustic solution Cation softeners -- sulfuric acid solution	Combined sewer
			1,000 lbs solid, metal waste per month	Metal, scrap equipment	Landfill
253 (1st floor)	Ordnance Shop -- cleaning, paint stripping, and painting of steel	2 gpm	3,000 gal. chemical soution tank 4 times per year	Sodium hydroxide, Stoddard solvent, Steam-Kleen, and various paints	Combined sewer
ELECTRICAL GROUP					
124	Acid Mixing Plant -- washdown of spilled acid, draining of acid tanks	---	1,000 gal. per month washdown water	Sulfuric acid and distilled water (combined to form electrolyte for storage batteries)	Storm sewer
253 (2nd, 4th & 5th floors)	Electronic and Optical Shop -- cleaning, paint stripping and painting of aluminum and steel	2 gpm (total)	300 gal. chemical solution tank once per month	Sodium hydroxide, Oakite aluminum cleaner 164, and various paints	Combined sewer
351	Electronics Shop -- cleaning and painting electronic equipment	1 gpm	---	Chem-mist detergent, very small quantities of alcohol and trichloroethylene	Combined sewer
351	Electronics Shop -- photographic reproduction and photo developing	30 gpm	200 gal. per week from chemical solution trays	Ammonium thiosulfate, silver, salts, acetic acid, sodium sulfite, sodium carbonate, and minute quantities of cyanides. Also various chemicals washed off print paper.	Combined sewer
351A	Electronics Shop -- cleaning of electronic equipment	100 gal. per day	---	Chem-mist detergent, small amounts of thinner and solvent	Combined sewer
123	Battery Overhaul -- discharge of electrolyte from batteries to be reconditioned, and washdown water	100 gpm during periods when electrolytle being discharged	---	"Used" electrolyte (sulfuric acid and distilled water), soda ash (for partial neutralization)	Storm sewer

Table 3. Summary of Sources and Quantities of Chemicals from Industrial Activities (Westec, 1984) (continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials*	Method of Disposal
123	Plating Shop -- electroplating, paint stripping, irriditing, and parkerizing	20 gpm	---	Cyanide Plating Solutions - Copper, cadmium, and silver Acidic Plating Solutions - Nickel, chrome, tin, lead, gold, and brass Other Chemical Solutions - Penetol X, irridite, and Parkocomposition Acid Solutions - Chromic, nitric, sulfuric, phosphoric, fluoboric, and Muriatic Used containers and buckets	Storm sewer
211	Machine and Electronic Test and Repair Shop -- paint stripping and painting	1/2 gpm	---	Sodium hydroxide, D-Floate, Steam-Kleen compound, and various paints	Combined sewer
232	Electronics Repair Shop -- no cleaning facilities	---	100 lbs. used parts per day	Electronic parts, wiring, radium dials	Landfill
SERVICE SHOP GROUP					
215	Fire House -- washing of apparatus	300 gal. per day	---	Detergent	Combined sewer
302	Transportation Shop -- cleaning transportation equipment	1 gpm	---	Decarbonizer, degreaser, and detergent	Combined sewer
530	Hobby Shop - car washing	300 gal. per day	---	Detergent	Combined sewer
436	Material Storage Bldg. -- washing garbage cans	2 gpm	500 gal. twice per year	Sodium hydroxide, detergent	Combined sewer
101	Reproduction Department -- blue-print, ozalid, and photo developing (small amount)	25 gpm	500 gal. per week from solution trays, etc.	Hydrogen peroxide, ammonia, photo-developer solutions and various chemicals washed off print paper	Combined sewer
217	Sheet Metal Shop -- spray painting	1 gpm	300 gal. twice per month	D-Floate, various paints	Landfill, Combined sewer
270	Paint Shop -- cleaning paint buckets	100 gal. per day	3,000 gal. chemical solution tank four times per year	Sodium hydroxide Used paint buckets	Combined sewer
271	Paint Shop -- spray painting	---	300 gal. once per week	D-Kleen, various paints	Landfill
366	Boat Shop -- painting and washing	100 gal.	300 gal. once per week	Epoxides, polyester resin, methylethyl-ketones	Combined sewer

A1998-4

Table 3. Summary of Sources and Quantities of Chemicals from Industrial Activities (Westec, 1984) (continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials*	Method of Disposal
435	Equipment Storage Bldg. -- spray painting	200 gal. per day	300 gal. once per week	Various paints, paint thinner	Combined sewer
111 and 112	Diesel Oil Pumping Plant -- draw-off from oil separator units, washdown of spillage	---	2,000 gal. per month	Emulsifying agent during washdown Waste oil	Oil reclamation plant, Storm sewer
113	Salvage Divers Shop -- no cleaning facilities	---	1,000 lbs per week	Waste metal equipments	Scrap yard, Landfill
203	Power Plant -- boiler blowdown and backwash from zeolite water softeners	5,000 gal. per month	1,500 gal. 10 times per month backwash	Softeners -- dilute sulfuric acid, salt solution	Combined sewer
272	Riggers Shop -- cleaning of chain hoists	100 gal. per day	---	Steam-Kleen	Combined sewer
280	Aluminum Cleaning Facility	1/2 gpm	5,000 gal. rinse tank once per month. Tri-sodium tank once per week. Wyandotte tank once every six months	Chemical Solution Tanks (1) Sodium phosphate tribasic (2) Wyandotte 2787 deoxidizer (No neutralization)	Combined sewer
	Oil Reclamation Plant -- gravity separation in open ponds	14,000 gal. per day	1,000,000 gal per year	Fuels Reclaimed - Bunker Oil, Lube Oil, and Diesel Oil Chemical Used - Dunkit (degreaser), Slix (oil emulsifier), Gamlen (oil emulsifier), Clock 06:39 (oil emulsifier)	Reclaimed oily wastewater to Bay
RADIOLOGICAL GROUP					
364	Chemistry	---	---	Radioactive Wastes	---
506	Radiochemistry	---	---	Radioactive Wastes	---
507	Biological Lab	---	---	Radioactive Wastes	---

Table 3. Summary of Sources and Quantities of Chemicals from Industrial Activities (Westec, 1984) (continued)

Building No.	Description of Originating Process	Waste Quantities: Continuous Average Flow	Waste Quantities: Periodic Discharge	Waste Chemicals and Materials*	Method of Disposal
508	Health Physics Office	---	---	Radioactive Wastes	---
509	Biological	---	---	Radioactive Wastes	---
510	Physics	---	---	Radioactive Wastes	---
815	Chemistry, Biology, Physics	---	---	Radioactive Wastes	---

* Chemical names of commercial compounds - available information listed below.

Nacconal powder - A wetting agent typically containing a sodium alkyl aryl sulphonate.
Penesolve 814 - Sodium hydroxide.
Steam Kleen - Proprietary surfactants, wetting agents, alkaline silicates and phosphates, chelating agent.
Stoddard Solvent - Nonane, trimethylbenzene.
Wyandotte M.F. acid - Ammonium hydrogen fluoride.
Wyandotte 2487 acid - Sodium bisulfate, chromic acid.

Table 4. Aboveground and Buried Storage Tanks (Westec, 1984)

Structure No.	Type of Tank**	Capacity (gals)	Location	Contents
S-117	Steel Up.	184,150	Near Bg. 112	Diesel Oil
S-118	Steel Up.	12,000	Near Bg. 112	Diesel Oil
S-119	Steel Up.	12,000	Near Bg. 112	Diesel Oil
S-120	Steel Up.	12,000	Near Bg. 112	Diesel Oil
S-121	Steel Up.	12,000	Near Bg. 112	Diesel Oil
S-122	Steel Up.	12,000	Near Bg. 112	Diesel Oil
S-123	Steel Up.	12,000	Near Bg. 112	Diesel Oil
S-124	Steel Up.	12,000	Near Bg. 112	***
S-125	Steel Up.	12,000	Near Bg. 112	***
S-126	Steel Up.	12,000	Near Bg. 112	Lube Oil
S-127*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-128*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-129*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-130*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-131*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-132*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-133*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-134*	Steel Horiz.	3,000	Near Bg. 111	Lube Oil
S-135	Steel U.G.	1,250	Near Bg. 116	Fuel Oil
S-136	Steel U.G.	750	Near Bg. 118	Fuel Oil
S-146*	Wood Up.	7,500	Near Bg. 124	Sulphuric Acid
S-147*	Wood Up.	5,000	Near Bg. 124	Distilled Water
S-148*	Wood Up.	5,000	Near Bg. 124	Distilled Water
S-149*	Wood Up.	5,000	Near Bg. 124	Electrolyte
S-150*	Wood Up.	5,000	Near Bg. 124	Electrolyte
S-209	Conc. U.G.	210,000	Near Bg. 203	Fuel Oil
S-211	Steel U.G.	3,000	Near Bg. 203	Fuel Oil
S-212	Steel U.G.	4,500	Near Bg. 203	Fuel Oil
S-213	Conc. U.G.	35,000	Near Bg. 203	Treated Water
S-214	Steel U.G.	21,924	Near Bg. 205	Fuel Oil
S-215	Steel U.G.	25,320	Near Bg. 270	Paint Thinner
S-304	Steel U.G.	6,880	Near Bg. 304	Gasoline
S-305	Steel Up.	6,880	Near Bg. 304	Gasoline
S-505	Steel Up.	630,000	Near Bg. 521	Fuel Oil
S-506	Steel Horiz.	21,000	Near Bg. 500	Gasoline
S-508	Steel U.G.	750	Near Bg. 500	Fuel Oil
S-711	Steel U.G.	5,000	Near Bg. 709	Gasoline
S-712	Steel U.G.	5,000	Near Bg. 709	Gasoline
S-713	Steel U.G.	5,000	Near Bg. 709	Gasoline
S-714	Steel U.G.	5,000	Near Bg. 709	Diesel Oil
S-801	Steel U.G.	10,800	Near Bg. 811	Diesel Oil
S-802	Steel U.G.	6,800	Near Bg. 811	Fresh Water
S-901	Steel Up.	420,000	Innes Ave.	Fresh Water
S-453	Unknown U.G.	Unknown	Near Bg. 435	Unknown
S-454	Unknown U.G.	Unknown	Near Bg. 435	Unknown

*Tanks have been removed.
**Up = Vertical
Horiz. = Horizontal
U.G. = Underground
***Data not available

Table 5. Summary of Triple A Waste Storage and Disposal Sites (DA, 1986)

Site No.*	Desciption of Waste type or Contamination	Quantity Disposed	Identified Contaminants (DHS Data)
1	Deteriorating drums, not labeled, visible ground staining, drums later removed.	Unknown	Metals, asbestos
2	Industrial debris, empty barrels, building materials, pipe lagging. Ongoing disposal as of 4/86.	Unknown	Metals, oil and grease, asbestos
3	Drums, pipe lagging, batteries, liquid wastes, and ground staining. Possible chemicals drained to storm sewer. Scrap metal recovery.	Unknown	PCBs, asbestos metals (lead), oil and grease
4	Drum crushing area; runoff from drums including paints and other solvents. Ground staining. Ongoing disposal as of 4/86. Trenches within this site have received acids, solvents, lead-based paints, paint chips, and paint sludges	Unknown; Trenches - 2000 gallons of liquid waste, total trench volume approx. 900 cubic yards.	PCBs, asbestos, metals, oil and grease; contents of the trench not sampled.
5	Sandblast waste.	2 piles on concrete pad	Not sampled
6	Drums stored, contents unknown, later removed.	Unknown	Not sampled
7	Waste oil/water, solvents and other liquid waste dumped on ground and into gully. Sludge on ground surface.	80,000-100,000 gallons in one event, total unknown	Not sampled
8	Oily sawdust, sandblast waste, rust.	Unknown	Asbestos, oil and grease
9	Barrel of oil-soaked rags, container labeled "PCBs." Container later removed. Other old drums and cans.	Unknown	PCBs, oil and grease
10	Drums stored, one labeled "PCB." Drums later pumped and removed. Ground staining.	Unknown	Oil and grease
11	Drums and industrial debris, drums later removed to unknown location.	Unknown	Not sampled
12	Tank used as incinerator, ground staining beneath, also waste oils, copper plates, circuit boards, photographic plates. Waste liquids from Tank 505 dumped in field.	2 trash cans and 1 dumpster, quantity of incinerated material unknown	PCBs, oil and grease

*Site numbers by U.S. Navy

Table 5. Summary of Triple A Waste Storage and Disposal Sites (DA, 1986)

Site No.*	Desciption of Waste type or Contamination	Quantity Disposed	Identified Contaminants (DHS Data)
13	Tank 505, berm area, two ponds, and trench all used to hold waste oil. Water separated from oil in Tank 505 disposed along beach.	Unknown	PCBs, metals, oil and grease
14	Industrial debris, empty drums, building material, waste pipe lagging. Ongoing disposal at site as of 4/86.	Unknown	Asbestos
15	Sandblast waste on concrete pad; subsequently removed/cleaned up by outside contractor.	Unknown	Not sampled
16	Industrial landfill; sandblast waste, and industrial debris, oily sand.	Approximately 8000-11,000 cubic yards	Asbestos, metals
17	Sandblast waste and asphalt, some liquid waste causing dermal reaction, ground staining still visible 11/86.	Unknown	Metals
18	Buried industrial debris, paint cans, and asphalt.	Unknown	Not sampled
19	Oily waste on ground in center of baseball field.	Unknown	Oil and grease
Unnumbered	North of Dago Mary's - waste oil on ground, later paved over.	50,000-100,000 gallons	Not sampled

*Site numbers by U.S. Navy

Table 6. Summary of Previous Field Work

Site	No. Borings	Depth Ranges (feet)	No. Wells	Depth Ranges (feet)	Other Field Methods
Industrial Landfill, IR-1	0	10-31	9	10-31	Magnetometer and VLF-EM, alpha and beta radioactivity analysis performed on water samples
Bay Fill Area, IR-2	12	14.5-34.5	5	17-20.5	
Oil Reclamation Ponds, IR-3	2	14.5-21	3	18.5-21	Magnetic survey
Scrap Yard, IR-4	9	5-6	0		
Old Transformer Storage Yard, IR-5	22	<5	0		
Tank Farm, IR-6	0		0		
Sub Base Area, IR-7					
A. Fill Area	3	20-47	4	18-21	
B. Painting Area	3	19.5-40	2	19.5	
C. Additional Area	6	12.5-37	0		
Building 503 PCB Study Area, IR-8	67	3.5-20.5	7	13-20.5	
Pickling and Plate Yard, IR-9	0		0		4 liquid samples from 3 dipping pits and sump
Battery and Electroplating Shop, IR-10	0		0		
Building 521 Power Plant, IR-11	0		0		8 hour air sample for asbestos
Galley Site (ERM-West)	4	10.5-15	1	15	
Alt. Galley Site (ERM-West)	5	11.5-15	1	15	
Area Study	103	5	0		47 surface samples for asbestos
Galley Site (HLA)	4	15.5-17	0		
Triple A sites*, IR-12 to IR-17					75 samples soil, liquids, sludge and wood

* Sample collection sites not indicated in DA's report (DA, 1986).

TABLE 7. MAXIMUM CONCENTRATIONS IN SOIL SAMPLES (EXPRESSED IN uG PER KG)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 OIL RECLAMATION PONDS	IR-4 SCRAP YARD	IR-5 OLD TRANSFORMER YARD	IR-6 TANK FARM	IR-7 SUB-BASE SANDBLAST	IR-8 BLDG 503 PCB SITE	IR-9 PICKLING & PLATE YARD	IR-10 BATTERY ELECTROPLATING	IR-11 BLDG 521 POWER PLANT	AREA A	AREA B
1,1,1-TRICHLOROBENZENE	310	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-TRICHLOROETHANE	561	44	--	--	--	--	--	--	--	--	--	7	--
1,1':2',1:-TERPHENYL	--	--	--	--	--	--	--	--	--	--	--	410	--
1,1':3',1"-TERPHENYL	20,000	--	--	--	--	--	2,900	--	--	--	--	1,700	--
1,1,3-TRIMETHYLCYCLOHEXANE	45	--	1,300	--	--	--	--	--	--	--	--	--	--
1,1-DICHLOROETHANE	45	20	--	--	--	--	--	--	--	--	--	--	--
1,1'-OXYBIS(2-ETHOXYETHANE)	--	--	230	--	--	--	--	--	--	--	--	--	--
1,2,3-TRICHLOROBENZENE	40	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3-TRIMETHYLBENZENE	8,100	720	30	--	--	--	--	--	--	1,900	--	1,300	1,900
1,2,3-TRIMETHYLCYCLOHEXANE	--	--	20	--	--	--	--	--	--	--	--	--	--
1,2,4-TRICHLOROBENZENE	270	--	12,000	--	--	--	--	--	--	--	--	270	--
1,2,4-TRIMETHYLBENZENE	180,000	1,700	--	--	--	--	--	--	--	3,400	--	550	3,400
1,2-DICHLORO-1,1,2-TRIFLUOROETHANE	165	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROETHANE	1	--	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	32	--	76,000	--	--	--	--	--	--	--	--	--	--
1-ETHYL-2-METHYLBENZENE	--	--	130	--	--	--	--	--	--	--	--	--	--
1,3,5-TRICHLOROBENZENE	250	--	--	--	--	--	--	--	--	--	--	--	--
1,3-DICHLOROBENZENE	33	--	92,000	--	--	--	--	--	--	--	--	--	--
1,3,3-TRIMETHYLBICYCLO[2.2.1]HEPTAN-2-ONE	--	60	--	--	--	--	--	--	--	--	--	--	--
1,3,3-TRIMETHYLTRICYCLO[2.2.1.02,6]HEPTANE	--	20	--	--	--	--	--	--	--	--	--	--	--
1,3-ISOBENZOFURANDIONE	--	1,000	--	--	--	--	--	--	--	--	--	--	--
1,3-OXATHIOLANE	180	25	--	--	--	--	--	--	--	--	--	--	--
1,2-DICHLOROBENZENE	6,900	--	110,000	--	--	--	--	--	--	--	--	--	--
1,4-DICHLOROBENZENE	8,000	--	70,000	--	--	--	--	--	--	--	--	--	--
1,4-DIMETHYLCYCLOOCTANE	--	30	490	--	--	--	--	--	--	--	--	--	--
1,7,7-TRIMETHYLTRICYCLOHEPTANE	10	--	--	--	--	--	--	--	--	--	--	--	--
1-METHYL-2-METHYLHEPTANE	--	--	210	--	--	--	--	--	--	--	--	--	--
1-CHLORO-4-METHYLBENZENE	--	--	50	--	--	--	--	--	--	--	--	--	--
1-ETHYL-2,3-DIMETHYLBENZENE	--	830	--	--	--	--	--	--	--	--	--	--	--
1-ETHYL-2-METHYLBENZENE	15,000	--	50	--	--	--	--	--	--	--	--	--	--
1-ETHYL-4-METHYLBENZENE	40	--	--	--	--	--	--	--	--	--	--	--	--
1-(ETHENYLOXY)OCTADECAN	--	500	--	--	--	--	--	--	--	--	--	--	--
1H-INDENE	100	--	--	--	--	--	--	--	--	--	--	--	--
1-METHYL-4-PROPYLBENZENE	--	--	90	--	--	--	--	--	--	--	--	--	--
1-METHYLETHYLBENZENE	40	--	5	--	--	--	--	--	--	--	--	--	--
1-METHYLNAPHTHALENE	--	9,000	60	--	--	--	--	--	--	--	--	--	--
1-METHYLPROPYLBENZENE	3,800	--	300	--	--	--	--	--	--	--	--	--	--
1-PROPENYLBENZENE	130	--	--	--	--	--	--	--	--	--	--	--	--
1-PROPYLBENZENE	26	--	15	--	--	--	--	--	--	--	--	--	--
2,2,5,5-TETRAMETHYL-3-HEXENE	--	--	20	--	--	--	--	--	--	--	--	--	--
2,2'-OXYBISETHANOL	30	--	30	--	--	--	--	--	--	--	--	700	--
2,3,7-TRIMETHYLOCTANE	--	--	18,000	--	--	--	--	--	--	--	--	--	--
1,2,3,4-TETROHYDRONAPTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	240
1,2,3,4-TETRAHYDRO-5METHYLNAPTHALENE	--	--	--	--	--	--	--	--	--	--	--	--	120
2,4-DICHLOROPHENOL	--	--	39,000	--	--	--	--	--	--	--	--	--	--
2,4-DIMETHYLHEPTANE	40	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 7. MAXIMUM CONCENTRATIONS IN SOIL SAMPLES (EXPRESSED IN UG PER KG)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 OIL RECLAMATION PONDS	IR-4 SCRAP YARD	IR-5 OLD TRANSFORMER YARD	IR-6 TANK FARM	IR-7 SUB-BASE SANDBLAST	IR-8 BLDG 503 PCB SITE	IR-9 PICKLING & PLATE YARD	IR-10 BATTERY ELECTROPLATING	IR-11 BLDG 521 POWER PLANT	AREA A	AREA B
2,4-DIMETHYLPHENOL	100	120	--	--	--	--	--	--	--	--	--	--	--
2,5-DIMETHYLBENZENEBUTANOICACID	20	--	--	--	--	--	--	--	--	--	--	--	--
2,5-DIMETHYLPHENOL	--	--	50	--	--	--	--	--	--	--	--	--	--
2,6,10,14-TETRAMETHYLHEPTADECANE	270	24,000	--	--	--	--	4,100	--	--	470	--	8,900	470
2,6,10,14-TETRAMETHYLHEPTANE	--	--	--	--	--	--	330	--	--	--	--	--	--
2,6,10,14-TETRAMETHYLPENTADECANE	--	900	1,800	--	--	--	--	--	--	--	--	--	--
2,6,10-TRIMETHYLHEXADECANE	220,000	2,500	70	--	--	--	1,800	--	--	--	--	6,900	--
2,6,10-TRIMETHYLHEPTADECANE	--	2,400	--	--	--	--	--	--	--	--	--	--	--
2,6,11-TRIMETHYLDODECANE	--	300	47,000	--	--	--	--	--	--	--	--	--	--
2,6-DIMETHYLNONANE	--	--	6,900	--	--	--	--	--	--	--	--	--	--
2,6-DIMETHYLPHENOL	--	--	50	--	--	--	--	--	--	--	--	--	--
2,7-DIMETHYLNAPHTHALENE	--	--	60	--	--	--	--	--	--	--	--	--	--
2-BUTYL-1-OCTANOL	--	600	--	--	--	--	--	--	--	--	--	--	--
2-BUTANONE	1,500	--	20	--	--	--	20	--	--	--	--	--	--
2-ETHYL-1,4-DIMETHYLBENZENE	100,000	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLBUTYLCYCLOPENTANE	--	--	45	--	--	--	--	--	--	--	--	--	--
2-METHYLBUTANE	25	--	--	--	--	--	--	--	--	--	--	--	--
2-METHYLNAPHTHALENE	120,000	16,000	27,000	--	--	--	--	--	--	1,100	--	290	1,100
2-METHYLPHENANTHRENE	--	6,000	--	--	--	--	--	--	--	--	--	--	--
(2-METHYLBUTYL)CYCLOBUTANE	--	--	47	--	--	--	--	--	--	--	--	--	--
(2-METHOXYETHENYL)BENZENE	--	600	--	--	--	--	--	--	--	--	--	--	--
2-PROPYL-1-HEPTANOL	--	--	45	--	--	--	--	--	--	--	--	--	--
2-PHENYLNAPHTHALENE	240	--	--	--	--	--	--	--	--	--	--	--	--
2-PROPENYLBENZENE	--	75	--	--	--	--	--	--	--	--	--	--	--
3,4-DIMETHYLPHENOL	--	--	16	--	--	--	--	--	--	--	--	--	--
3,5,24-TRIMETHYLTETRACONTANE	--	310	--	--	--	--	410	--	--	--	--	--	--
3-METHYL-4PENTEN-1-01	--	--	25	--	--	--	--	--	--	--	--	--	--
4,11-DIMETHYLTETRADECANE	--	--	45,000	--	--	--	--	--	--	--	--	--	--
2-METHYLBENZENESULFONAMIDT	--	--	--	--	--	--	--	--	--	470	--	--	470
4,7-DIMETHYLUNDECANE	--	340	--	--	--	--	180	--	--	--	--	--	--
4-ETHYL-3-HEPTENE	--	50	--	--	--	--	--	--	--	--	--	--	--
4H-CYCLOPENTA(DEF)PHENANTHRENE	--	8,000	--	--	--	--	--	--	--	--	--	--	--
4-METHYL-2-PENTANAMINE	25	--	--	--	--	--	--	--	--	--	--	--	--
4-METHYLBENZENESULFONAMIDE	--	--	--	--	--	--	--	--	--	2,200	--	--	2,200
4-METHYLDIBENZOFURAN	--	6,000	--	--	--	--	--	--	--	--	--	--	--
4-METHYLPHENOL	30,000	1,400	96	--	--	--	--	--	--	--	--	140	--
4(PHENYLMETHYL)BENZOIC ACID	--	2,000	--	--	--	--	--	--	--	--	--	--	--
5-DECENE	--	10	--	--	--	--	--	--	--	--	--	--	--
5-PROPYLTRIDECANE	--	--	--	--	--	--	--	--	--	2,400	--	--	2,400
6,9-DIMETHYLTETRADECANE	--	280	--	--	--	--	--	--	--	--	--	--	--
6-METHYLDODECANE	--	--	--	--	--	--	--	--	--	1,500	--	--	1,500
6-METHYLOCTADECANE	--	230	--	--	--	--	--	--	--	--	--	--	--
7-BUTYLDOCOSANE	--	1,600	--	--	--	--	--	--	--	--	--	--	--
8-METHYL-1-DECENE	--	40	--	--	--	--	--	--	--	--	--	--	--
9H-FLUOREN-9-ONE	--	12,000	--	--	--	--	--	--	--	--	--	--	--
9-OCTADECENAMIDE	--	1,200	--	--	--	--	--	--	--	--	--	--	--

TABLE 7. MAXIMUM CONCENTRATIONS IN SOIL SAMPLES (EXPRESSED IN uG PER KG)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 OIL RECLAMATION PONDS	IR-4 SCRAP YARD	IR-5 OLD TRANSFORMER YARD	IR-6 TANK FARM	IR-7 SUB-BASE SANDBLAST	IR-8 BLDG 503 PCB SITE	IR-9 PICKLING & PLATE YARD	IR-10 BATTERY ELECTROPLATING	IR-11 BLDG 521 POWER PLANT	AREA A	AREA B
ACENAPHTHENE	--	20,000	340	--	--	--	--	--	--	--	--	--	--
ACENAPHTHYLENE	350	120	3,100	--	--	--	--	--	--	--	--	400	--
ACETONE	300	40	210	--	--	--	48	--	--	--	--	59	--
ANTIMONY	28,000	--	--	--	--	--	1,800	--	--	--	--	--	--
ANTHRACENE	540	7,900	1,400	--	--	--	--	--	--	--	--	600	--
ARSENIC	15,000	--	--	3,900	--	--	5,800	--	30,000	--	--	--	--
ASBESTOS	--	2 PERCENT	--	--	--	--	--	--	--	--	--	--	--
ASBESTOS CHRYSOTILE	--	--	--	34 PERCENT	--	--	5 PERCENT	--	--	--	--	--	--
BUTYL BENZYL PHTHALATE	7,600	--	740	--	--	--	--	--	--	--	--	--	430
BENZENE	31	--	300	--	--	--	--	--	--	--	--	9	--
BERYLLIUM	350	--	--	--	--	--	2,600	--	--	--	--	--	--
BIS (2-ETHYLHEXYL) PHTHALATE	40,000	8,200	30,000	--	--	--	700	--	--	3,000	--	6,700	3,000
BENZOIC ACID	320	--	--	--	--	--	--	--	--	--	--	--	--
BENZO (a) ANTHRACENE	1,700	7,300	1,900	--	--	--	--	--	--	130	--	2,900	130
BENZO (b) FLUORANTHENE	2,700	6,000	--	--	--	--	120	--	--	120	--	4,800	120
BENZ(E)ACEPHENANTHRYLENE	--	--	--	--	--	--	--	--	--	--	--	400	--
BENZO[GHI]FLUORANTHENE	260	--	--	--	--	--	--	--	--	--	--	--	--
BENZO[J]FLUOROANTHENE	--	--	--	--	--	--	--	--	--	--	--	570	--
BENZO (k) FLUORANTHENE	2,000	4,900	2,300	--	--	--	130	--	--	--	--	6,400	--
BENZO (g,h,i) PERYLENE	1,900	520	1,100	--	--	--	--	--	--	170	--	1,500	170
BENZO (a) PYRENE	2,100	2,600	2,300	--	--	--	160	--	--	210	--	3,500	210
BENZO(E)PYRENE	1,400	--	--	--	--	--	--	--	--	--	--	--	--
CADMIUM	4,500	--	--	--	--	--	3,800	--	54,000	--	--	--	--
CARBONDISULFIDE	13	4	23	--	--	--	--	--	--	--	--	--	--
CHRYSENE	3,400	6,800	3,300	--	--	--	310	--	--	--	290	3,300	--
CIS-OCTAHYDRO-1H-INDENE	--	--	45	--	--	--	--	--	--	--	--	--	--
CIS-OCTAHYDROPENTALENE	--	--	100	--	--	--	--	--	--	--	--	--	--
CHLOROETHANE	28	--	--	--	--	--	--	--	--	--	--	--	--
CHLOROBENZENE	19	--	6,000	--	--	--	--	--	--	--	--	--	--
CHLOROTRIS(2-METHYLPROPYL)STANNANE	--	5,600	--	--	--	--	--	--	--	--	--	5,300	--
CHROMIUM	290,000	270,000	260,000	--	--	--	500,000	--	55,000,000	650,000	--	490,000	650,000
COPPER	6,300,000	37,000,000	1,600,000	420,000	--	--	810,000	--	940,000	380,000	--	4,000,000	380,000
CYANIDE	170	--	--	--	--	--	--	--	--	--	--	--	--
CYCLOHEXANE	--	--	150	--	--	--	--	--	--	--	--	--	--
CYCLOPENTACYCLOOCTENE	240	--	--	--	--	--	--	--	--	--	--	--	--
DIBENZO (a,h) ANTHRACENE	--	220	420	--	--	--	--	--	--	--	--	--	--
DI-n-BUTYL PHTHALATE	34	--	900	--	--	--	850	--	--	--	--	400	--
DIBENZOFURAN	7	16,000	1,400	--	--	--	--	--	--	--	--	400	--
DIBENZOTHIOPHENYL	250	--	--	--	--	--	--	--	--	--	--	--	--
DODECANAMIDE	--	430	--	--	--	--	--	--	--	--	--	--	--
DECANE	--	--	--	--	--	--	--	--	--	780	--	--	780
HBP FUEL HYDROCARBONS DIESEL W FID	--	--	--	--	--	--	210,000	--	--	--	--	--	--
DOCOSANE	15,000	980	2,600	--	--	--	290	--	--	--	--	5,300	--
DI-N-OCTYL PHTHALATE	--	--	350	--	--	--	--	--	--	--	--	320	--
DODECANE	--	--	19,000	--	--	--	--	--	--	390	--	--	390
DODECAHYDRONAPHTHALENE	--	45	--	--	--	--	--	--	--	--	--	--	--

TABLE 7. MAXIMUM CONCENTRATIONS IN SOIL SAMPLES (EXPRESSED IN uG PER KG)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 OIL RECLAMATION PONDS	IR-4 SCRAP YARD	IR-5 OLD TRANSFORMER YARD	IR-6 TANK FARM	IR-7 SUB-BASE SANDBLAST	IR-8 BLDG 503 PCB SITE	IR-9 PICKLING & PLATE YARD	IR-10 BATTERY ELECTROPLATING	IR-11 BLDG 521 POWER PLANT	AREA A	AREA B
ETHYLBENZOICACID	..	..	30	..	..	..	..	..	..	..	..	..	..
ETHYLCYCLOHEXANE	3,800	..	..	..	..	..	..	..	..	..	..	..	..
EICOSANE	180,000	1,300	2,200	..	..	..	1,600	..	..	..	..	7,600	..
ETHYL BENZENE	12,000	3	3,000	..	..	..	..	..	..	..	..	..	..
FLUORANTHENE	2,800	31,000	2,300	..	..	..	150	..	..	730	..	5,500	730
FLUORENE	360	1,300	4,100	..	..	..	..	..	..	..	..	530	..
LEAD	52,000,000	550,000	270,000	58,000	..	..	7,200,000	..	4,000,000	210,000	..	4,700,000	210,000
HENEICOSANE	150,000	900	2,300	..	..	..	2,700	..	..	..	..	6,000	..
HEPTACOSANE	31,000	5,500	4,700	..	..	..	250	..	..	..	..	9,000	..
HEXACOSANE	34,000	5,000	4,800	..	..	..	300	..	..	..	..	9,000	..
HEPTACHLOROBIPHENYL	..	..	..	..	..	..	..	..	..	..	..	137,000	..
HEPTADECANE	31,000	1,200	15,000	..	..	..	290	..	..	2,000	..	280	2,000
HEXACHLOROBIPHENYL	..	..	..	..	..	..	..	..	..	..	..	263,000	..
HEXADECANOICACID	..	..	1,500	..	..	..	..	..	..	..	..	930	..
HEXADECANE	230,000	2,400	2,900	..	..	..	5,800	..	..	..	..	7,600	..
INDENO (1,2,3-cd) PYRENE	1,300	530	1,100	..	..	..	..	..	..	130	..	1,400	130
MERCURY	6,100	..	..	..	..	..	810	..	..	..	..	..	..
METHYLCYCLOHEXANE	..	..	20	..	..	..	..	..	..	..	..	..	..
METHYLENE CHLORIDE	33	..	..	..	..	..	..	..	..	..	..	..	..
METHYLCYCLOPENTANE	20	..	150	..	..	..	..	..	..	..	..	..	..
METHYLESTERBUTANOICACID	4,900	..	..	..	..	..	..	..	..	..	..	..	..
NAPHTHALENE	84,000	29,000	10,000	..	..	..	..	..	..	960	..	140	960
NONACOSANE	18,000	8,100	310	..	..	..	200	..	..	..	..	6,100	..
NICKEL	1,000,000	..	..	..	..	..	1,700,000	..	250,000	1,300,000	..	1,400,000	1,300,000
N,N-DIMETHYL-1-DODECNAMINE	..	1,500	..	..	..	..	..	..	..	..	..	..	..
N-NITROSODIMETHYLAMINE	4	..	..	..	..	..	..	..	..	..	..	..	..
NONADECANOICACID	..	..	2,000	..	..	..	..	..	..	..	..	..	670
NONADECANE	190,000	900	2,600	..	..	..	4,000	..	..	..	..	7,600	..
OCTAHYDRO-1H-INDENE	..	60	..	..	..	..	..	..	..	..	..	..	..
OCTYL-CYCLOPENTANE	..	..	10	..	..	..	..	..	..	..	..	..	..
OCTACHLOROBIPHENYLS	..	..	..	..	..	..	..	..	..	..	..	60,500	..
OCTADECENAMIDE	..	670	..	..	..	..	..	..	..	..	..	..	..
OCTADECANE	190,000	1,600	32,000	..	..	..	2,100	..	..	2,600	..	9,400	2,600
OCTAHYDRO-2-METHYLPENTALENE	..	..	15	..	..	..	..	..	..	..	..	..	..
OCTACOSANE	25,000	53,000	3,200	..	..	..	870	..	..	..	..	..	6,700
OCTYLDIPHENYLESTERPHOSPHORIC ACID	..	670	..	..	..	..	..	..	..	..	..	..	..
O-DECYLHYDROXYLAMINE	..	1,300	..	..	..	..	..	..	..	..	..	..	..
HBP FUEL HYDROCARBONS OIL W FID	..	..	..	..	..	..	..	..	..	..	..	..	..
PCBs	89,500	..	..	13,000	15,000	..	..	28,000	..	..	..	..	..
PROPYLCYCLOHEXANE	..	..	..	700	..	..	..	..	..	..	..	..	..
PENTACOSANE	76,000	4,500	..	2,600	..	..	230	..	..	..	..	8,500	..
PENTADECANE	..	2,400	..	16,000	..	..	5,900	..	..	260	..	6,800	260
PENTACHLOROPHENOL	..	320	..	..	..	..	..	..	..	..	..	..	..
PENTANE	30	..	..	..	..	..	..	..	..	..	..	..	..
PHENANTHRENE	5,200	61,000	16,000	..	..	..	190	..	..	560	..	3,600	560
PHENOL	2,800	..	120	..	..	..	..	..	..	..	..	..	85

TABLE 7. MAXIMUM CONCENTRATIONS IN SOIL SAMPLES (EXPRESSED IN uG PER KG)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 OIL RECLAMATION PONDS	IR-4 SCRAP YARD	IR-5 OLD TRANSFORMER YARD	IR-6 TANK FARM	IR-7 SUB-BASE SANDBLAST	IR-8 BLDG 503 PCB SITE	IR-9 PICKLING & PLATE YARD	IR-10 BATTERY ELECTROPLATING	IR-11 BLDG 521 POWER PLANT	AREA A	AREA B
PHENANTHRENECARBOXYLIC ACID	--	670	--	--	--	--	--	--	--	--	--	--	--
PERYLENE	530	--	--	--	--	--	--	--	--	--	--	--	--
PENTATRIACONTANE	--	2,600	--	--	--	--	--	--	--	--	--	--	--
PYRENE	3,300	16,000	6,900	--	--	--	150	--	--	540	--	5,300	540
MOLECULAR SULFUR (SE)	12,000	5	--	--	--	--	480	--	--	--	--	--	--
ELECTRICAL CONDUCTIVITY	47,000	>20000	--	--	--	--	--	--	--	--	--	--	--
SELENIUM	48	--	--	--	--	--	--	--	1,700	--	--	--	--
SILVER	1,700	--	--	--	--	--	1,500	--	--	--	--	--	--
TIN	--	72	410,000	--	--	--	400,000	--	--	--	--	--	--
TRANS-1,2-DICHLOROETHENE	21	--	9	--	--	--	--	--	--	--	--	--	--
TRANS-1,4,-DIMETHYLCYCLOOCTANE	--	--	100	--	--	--	--	--	--	--	--	--	--
METRAMETHLYTRICYCLO-OCTO-3-ENE	140	--	--	--	--	--	--	--	--	--	--	--	--
TRICYCLO[3.3.1.13,7]DECANE	--	10	--	--	--	--	--	--	--	--	--	--	--
TRICYCLOUNDECAN-1-AMINE	25	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROETHENE	49	15	--	--	--	--	2	--	--	--	--	--	--
TRICHLOROFLUOROMETHANE	--	--	--	--	--	--	3	--	--	--	--	--	--
TRICHLOROMETHANE	25	--	--	--	--	--	--	--	--	--	--	--	--
TRICHLOROTRIFLUOROETHANE	9	94	--	--	--	--	5	--	--	--	--	--	--
TRIDECANE	22,000	--	--	--	--	--	--	--	--	--	--	--	--
1,2,3,4-TETRAHYDRO-6-METHYLNAPHYHALENE	--	--	--	--	--	--	--	--	--	120	--	--	120
1,2,3,4-TETRAHYDRO-5-METHYLNAPHYHALENE	--	--	--	--	--	--	--	--	--	120	--	--	120
1,2,3,4-TETRAHYDRO-6,7-DIMETHYLNAPHYHALENE	--	--	--	--	--	--	--	--	--	110	--	--	110
TETRACHLOROETHENE	--	620	--	--	--	--	--	--	--	--	--	--	--
TETRACOSANE	90,000	3,600	3,900	--	--	--	1,500	--	--	--	--	7,200	--
TETRADECANE	--	--	13,000	--	--	--	3,900	--	--	170	--	--	170
TETRAHYDROFURAN	45	--	40	--	--	--	--	--	--	--	--	--	--
THALLIUM	16,000	--	--	--	--	--	121,000	--	15,000	--	--	--	--
TRIMETHYLBICYCLOHEPTAN-2-ONE	40	--	--	--	--	--	--	--	--	--	--	--	--
TRIMETHYLSILANOL	50	--	--	--	--	--	--	--	--	--	--	18	--
TRIMETHYL-TRICYCLO-HEXANE	--	--	30	--	--	--	--	--	--	--	--	--	--
TOLUENE	16,000	2	3,000	--	--	--	--	--	--	--	--	14	--
TOTAL XYLENES	--	--	4,000	--	--	--	--	--	--	--	--	--	--
TOTAL PETROLEUM HYDROCARBONS	--	--	--	--	--	--	--	--	--	16,000	--	1,300	16,000
TERPHENYL	27,000	--	--	--	--	--	2,200	--	--	2,900	--	2,300	2,900
TETRATETRACONTANE	--	600	--	--	--	--	--	--	--	--	--	--	--
UNDECANE	--	1,600	60	--	--	--	--	--	--	2,700	--	850	2,700
VINYL CHLORIDE	29	--	57	--	--	--	--	--	--	--	--	--	--
XYLENES	42,000	36	--	--	--	--	--	--	--	--	--	--	--
ZINC	3,200,000	2,600,000	1,900,000	220,000	--	--	700,000	--	150,000,000	1,800,000	--	3,800,000	1,800,000
pH	9.2	6.9	8.9	9.8	--	--	7.7	--	12.3	--	--	--	--

NOTE: "--" = ND OR NOT ANALYZED FOR
ONLY COMPOUNDS DETECTED IN AT LEAST ONE SAMPLE ARE INCLUDED
DATA FROM EMCON(1987a,1987b),ERM-WEST(1986a,1986b,1987b)

TABLE 8. MAXIMUM CONCENTRATIONS IN WATER SAMPLES (EXPRESSED IN uG PER L)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 * OIL RECLAMATION PONDS	IR-7 SUB-BASE SANDBLASTING & PAINTING AREA	IR-8 BLDG 503 PCB SITE
1,1,3-TRIMETHYLCYCLOHEXANE	--	--	30	--	--
1,1-DICHLOROETHANE	45	--	--	--	--
1,1'-OXYBIS(2-ETHOXYETHANE)	--	--	230	--	--
1,2,3-TRICHLOROBENZENE	40	--	--	--	--
1,2,4-TRICHLOROBENZENE	210	--	--	--	--
1,2,4-TRIMETHYLBENZENE	40	--	--	--	--
1,2-DICHLORO-1,1,2-TRIFLUOROETHANE	165	--	--	--	--
1,2-DICHLOROETHANE	4	--	--	--	--
1,2-DICHLOROBENZENE	49	--	34	--	--
1,3,5-TRICHLOROBENZENE	250	--	--	--	--
1,3-DICHLOROBENZENE	33	--	22	--	--
1,3-OXATHIOLANE	180	25	--	--	--
1,2-DICHLOROBENZENE	--	--	20	--	--
1,4-DICHLOROBENZENE	67	--	90	--	--
1,7,7-TRIMETHYLTRICYCLOHEPTANE	10	--	--	--	--
1-ETHYL-2-METHYLBENZENE	--	--	130	--	--
1H-INDENE	100	--	--	--	--
1-METHYLNAPHTHALENE	--	--	40	--	--
1-PROPENYLBENZENE	130	--	--	--	--
1-PROPYLBENZENE	26	--	--	--	--
2,2'-OXYBISETHANOL	30	--	30	--	--
2,4-DIMETHYLPHENOL	--	--	16	--	--
2,5-DIMETHYLBENZENEBUTANOICACID	20	--	--	--	--
2,5-DIMETHYLPHENOL	--	--	50	--	--
2,6,10-TRIMETHYLHEXADECANE	--	--	70	--	--
2,6-DIMETHYLPHENOL	--	--	50	--	--
2,7-DIMETHYLNAPHTHALENE	--	--	60	--	--
2-METHYLNAPHTHALENE	--	--	700	--	--
2-METHYLPHENOL	--	--	19	--	--
(2-METHYLBUTYL)CYCLOBUTANE	--	--	47	--	--
4-METHYL-2-PENTANAMINE	25	--	--	--	--
ACENAPHTHYLENE	12	--	7	--	--
ANTIMONY	1,300	--	--	1,800	--
ANTHRACENE	2	--	--	--	--
ARSENIC	18	--	--	--	--
BUTYL BENZYL PHTHALATE	10	--	--	--	--
BENZENE	29	--	10	--	--
BIS (2-ETHYLHEXYL) PHTHALATE	15	--	8	--	--
BENZO (a) ANTHRACENE	--	--	3	--	--
BENZO (b) FLUORANTHENE	--	--	5	--	--

TABLE 8. MAXIMUM CONCENTRATIONS IN WATER SAMPLES (EXPRESSED IN uG PER L)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 * OIL RECLAMATION PONDS	IR-7 SUB-BASE SANDBLASTING & PAINTING AREA	IR-8 BLDG 503 PCB SITE
BENZO (k) FLUORANTHENE	--	--	2	--	--
BENZO (g,h,i) PERYLENE	--	--	5	--	--
BENZO (a) PYRENE	--	--	8	--	--
CADMIUM	100	--	--	650	--
CHRYSENE	--	--	34	--	--
CHLOROBENZENE	19	--	198	--	--
CHROMIUM	88	130	4,900	410	--
COPPER	--	100	130,000	--	--
CYANIDE	170	--	--	--	--
DI-n-BUTYL PHTHALATE	34	--	--	--	--
DIBENZOFURAN	7	--	2	--	--
ETHYLBENZOICACID	--	--	30	--	--
ETHYL BENZENE	13	--	3	--	--
FLUORANTHENE	--	--	5	--	--
FLUORENE	9	--	100	--	--
LEAD	39	350	71,000	34	--
HEXADECANE	--	--	60	--	--
INDENO (1,2,3-cd) PYRENE	--	--	2	--	--
METHYLENE CHLORIDE	33	--	--	--	--
NAPHTHALENE	--	4	290	--	--
NICKEL	240	--	--	390	--
N-NITROSODIMETHYLAMINE	4	--	--	--	--
PCBs	--	--	--	--	4
PHENANTHRENE	12	--	210	--	--
PHENOL	6	--	--	--	--
PHENOLS, DIRECT	470	--	--	--	--
PYRENE	--	--	52	--	--
MOLECULAR SULFUR (SE)	--	5	--	--	--
ELECTRICAL CONDUCTIVITY	--	>20,000	--	--	--
SELENIUM	41	--	--	--	--
SILVER	100	--	--	70	--
TIN	--	72	76	90	--
TRANS-1,2-DICHLOROETHENE	21	--	6	--	--
TRICYCLOUNDECAN-1-AMINE	25	--	--	--	--
TRICHLOROETHENE	3	--	--	--	--
TRICHLOROMETHANE	25	--	--	--	--
TETRADECANE	--	--	60	--	--
TETRAHYDROFURAN	45	--	40	--	--
TRIMETHYLBICYLOHEPTAN-2-ONE	40	--	--	--	--
TRIMETHYLSILANOL	50	--	--	--	--

TABLE 8. MAXIMUM CONCENTRATIONS IN WATER SAMPLES (EXPRESSED IN uG PER L)

PARAMETER	IR-1 INDUSTRIAL LANDFILL	IR-2 BAY FILL AREA	IR-3 * OIL RECLAMATION PONDS	IR-7 SUB-BASE SANDBLASTING & PAINTING AREA	IR-8 BLDG 503 PCB SITE
TOLUENE	50	--	6	--	--
UNDECANE	--	--	60	--	--
VINYL CHLORIDE	29	--	57	--	--
XYLENES	--	--	35	--	--
ZINC	90	230	26,000	60	--
pH	9.2	6.9	7.0	7.7	--

NOTE: "--" = ND OR NOT ANALYZED FOR
* SOME WELLS HAVE FLOATING PRODUCT
ONLY IR SITES WITH WELLS INCLUDED IN THIS TABLE
ONLY COMPOUNDS DETECTED IN AT LEAST ONE SAMPLE ARE INCLUDED
DATA FROM EMCON(1987a,1987b),ERM-WEST(1986a,1986b,1987b)

Table 9. Documentation Available for Past Data Validation

Investigation	Sampling Procedures	Analytical Methods	Well or Boring Locations	QA/QC Procedures	Copies of Certified Lab Reports	Copies of Chain of Custody Forms	Copies of Field Logs	Drafted Logs
onfirmation Study, erification Step EMCON, 1987a)	Yes	Yes	Yes	Yes	Yes	No	No	Yes
roposed Galley Investigation ERM-West, 1987a)	Partial	Yes	Yes	Partial	Yes	Yes	No	Yes
roposed Galley Investigation HLA, 1987)	Yes	Yes	Yes	Yes	Yes	No	No	Yes
rea Survey EMCON, 1987b)	Yes	Yes	Yes	Yes	Yes	No	No	Yes
uilding 503 PCB Spill nvestigation (ERM-West, 986a, 1986b, and 1987b)	Yes	Yes	Yes	Partial	Yes	No	Partial	No
n Francisco District Attorney's ffice, Investigation of Triple A ites (DA, 1986)	No	Yes	No	No	Yes	No	No	No

Table 10. Summary of Proposed Field Investigations

Site	No. of Test Borings	No. of Monitoring Wells	Geophysical Surveys**	Air Monitoring	Other Field Methods
Industrial Landfill	40 - 50	10 - 15	Yes	Yes	Soil Gas Survey, Radioactivity Survey Tidal Influence Study.
Bay Fill Area	90 - 100	10	Yes	Yes	Radioactivity Survey, Tidal Influence Study
Oil Reclamation Ponds	15 - 20	3	Yes	Yes	Soil Gas Survey, Tidal Influence Study, Microbiological Analyses
Scrap Yard	10	4	No	Yes	
Old Transformer Storage Yard	10 - 15	4	No	Yes	
Tank Farm	10 - 15	3	Yes	No	
Sub-Base Area	15 - 20	8	Yes	No	Radioactivity Screening, Tidal Influence Study
Building 503 PCB Spill Area	10 - 15	6	No	Yes	Tidal Influence Study
Pickling and Plate Yard	10 - 15	6	Yes	No	
Battery and Electroplating Shop	10 - 15	4	No	No	
Building 521 Power Plant	10 - 15	4	No	No	

* This summary represents a preliminary scope of work; the final scope will be presented in the Sampling Plan(s).

** Other than borehole clearance.

Table 11. General Response Actions and Associated Remedial Technologies

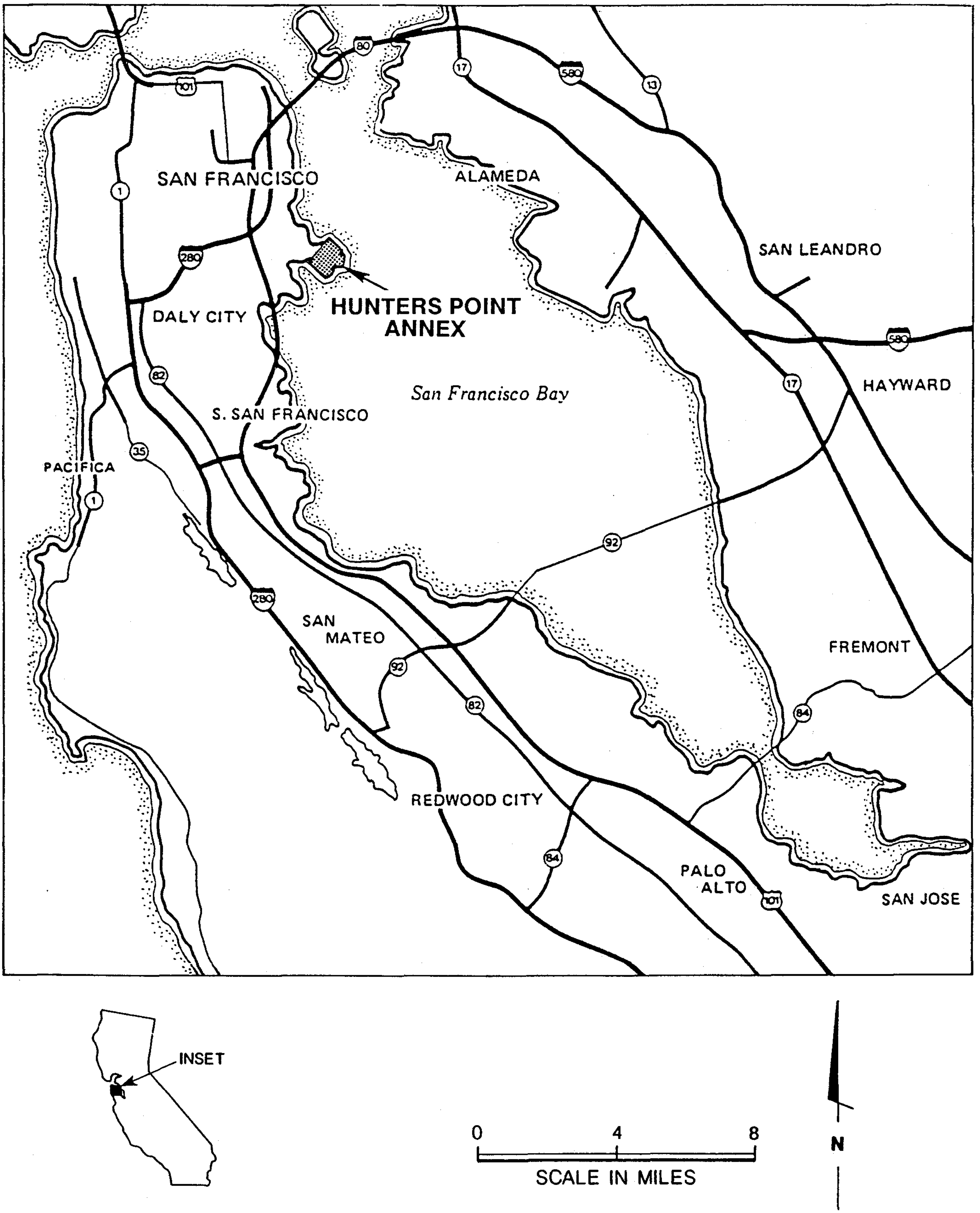
General Response Action	Technologies
No Action	Some monitoring and analyses may be performed.
Containment	Capping; ground-water containment barriers; bulkheads; gas barriers.
Pumping	Ground-water pumping; liquid removal; dredging.
Collection	Sedimentation basins; French drains; gas vents; gas collection systems.
Diversion	Grading; dikes and berms; stream diversion ditches; trenches; terraces and benches; chutes and downpipes; levees; seepage basins.
Complete Removal	Tanks; drums; soils; sediments; liquid wastes; contaminated structures; sewers and water pipes.
Partial Removal	Tanks; drums; soils; sediments; liquid wastes.
On-site Treatment	Incineration; solidification; land treatment; biological, chemical, and physical treatment.
Off-site Treatment	Incineration; biological, chemical, and physical treatment.
In Situ Treatment	Permeable treatment beds; bioreclamation; soil flushing; neutralization; land farming.
Storage	Temporary storage structures.
On-site Disposal	Landfills; land application.
Off-site Disposal	Landfills; surface impoundments; land application.

EPA, 1985e.

Table 11. General Response Actions and Associated Remedial Technologies (continued)

General Response Action	Technologies
Alternative Water Supply	Cisterns; aboveground tanks; deeper or upgradient wells; municipal water system; relocation of intake structure; individual treatment devices.
Relocation	Relocate residents temporarily or permanently.

ILLUSTRATIONS

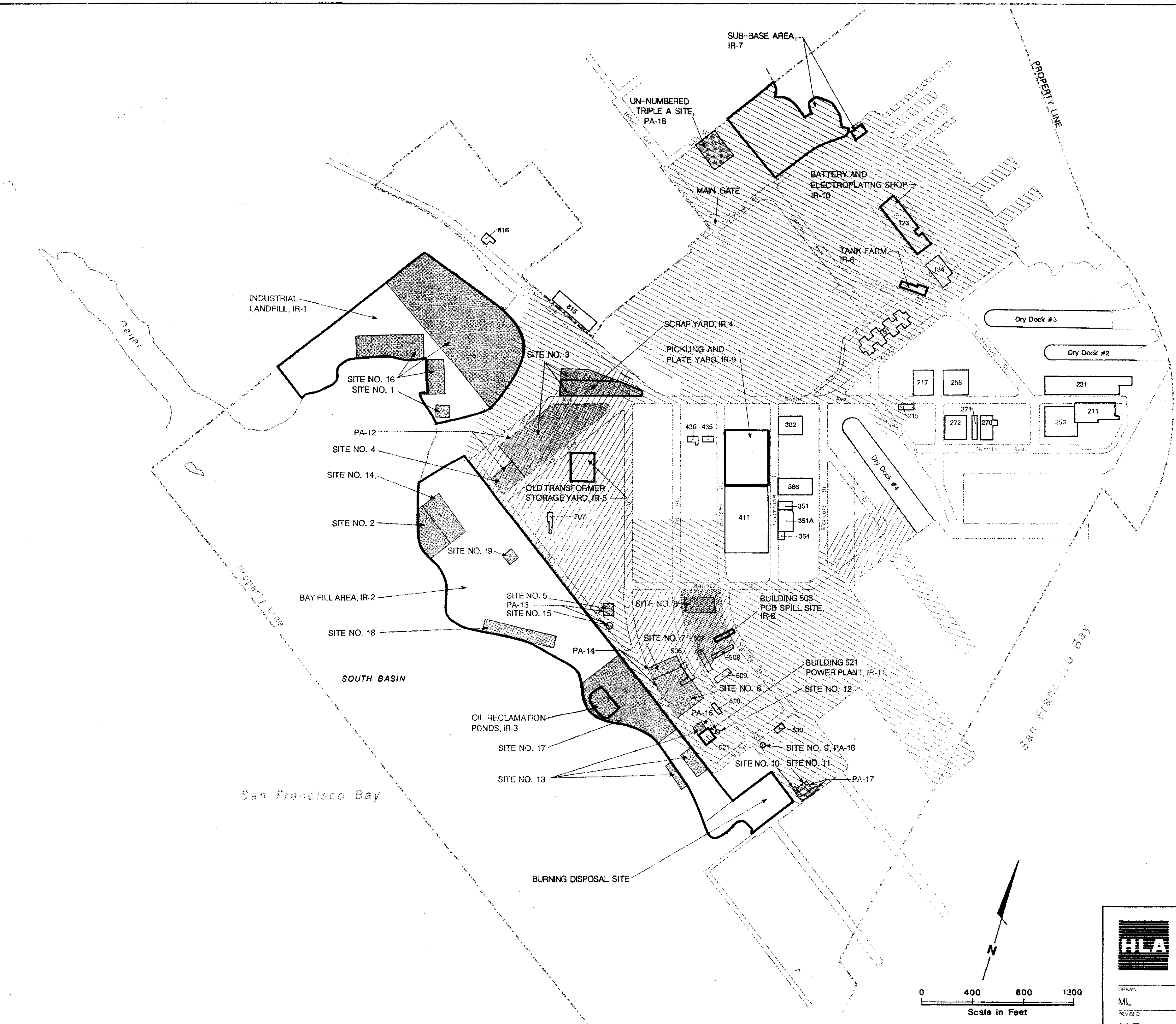


Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Location Map
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
DM	2176,121.02	SMF	11/87		



EXPLANATION

Area Study A

Area Study B

PCB Study Area

SITE NO. 14

Approximate Limits of Triple A Sites

SCRAP YARD, IR-4

Approximate Limits of Remedial Investigation Sites

824

Selected Existing Buildings

Boundary of Hunters Point Annex

Harding Lawson Associates
Engineers, Geologists & Geophysicists

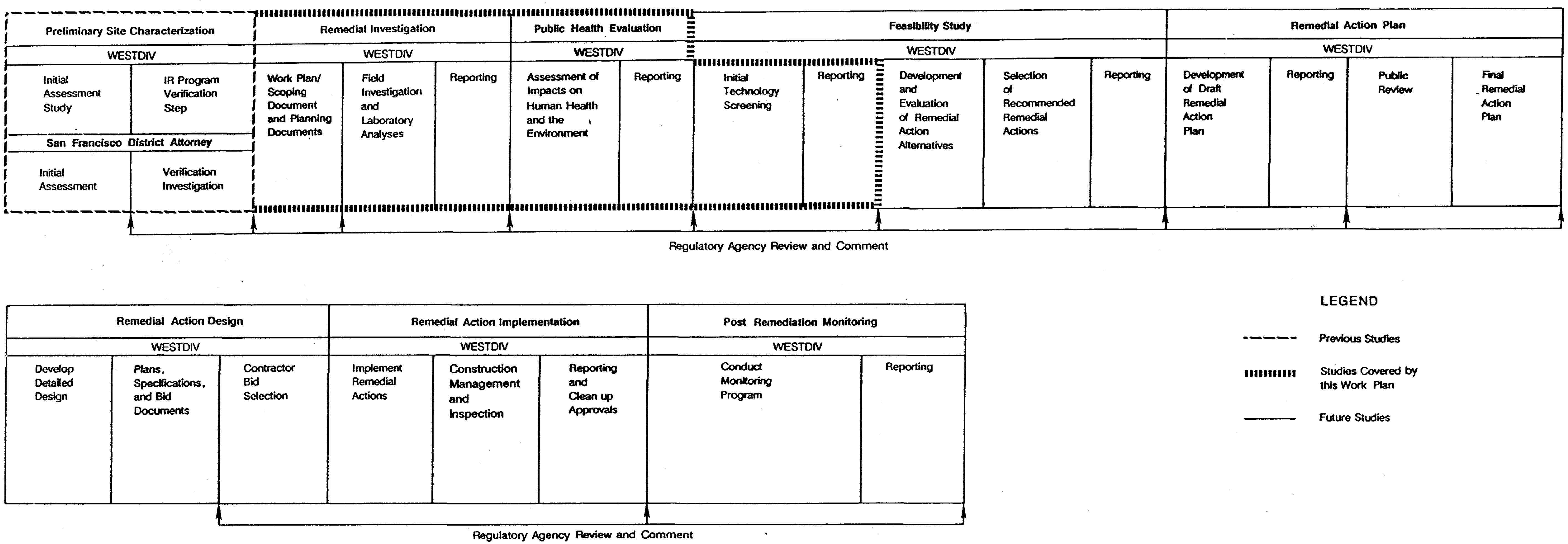
Site Plan
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE
ML	2176,021.02	SMF	11/87
REVISED	DATE	REVISED	DATE
SMF	2/88		

2995

HUNTERS POINT ANNEX
SITE CHARACTERIZATION AND REMEDIATION PROCESS DIAGRAM

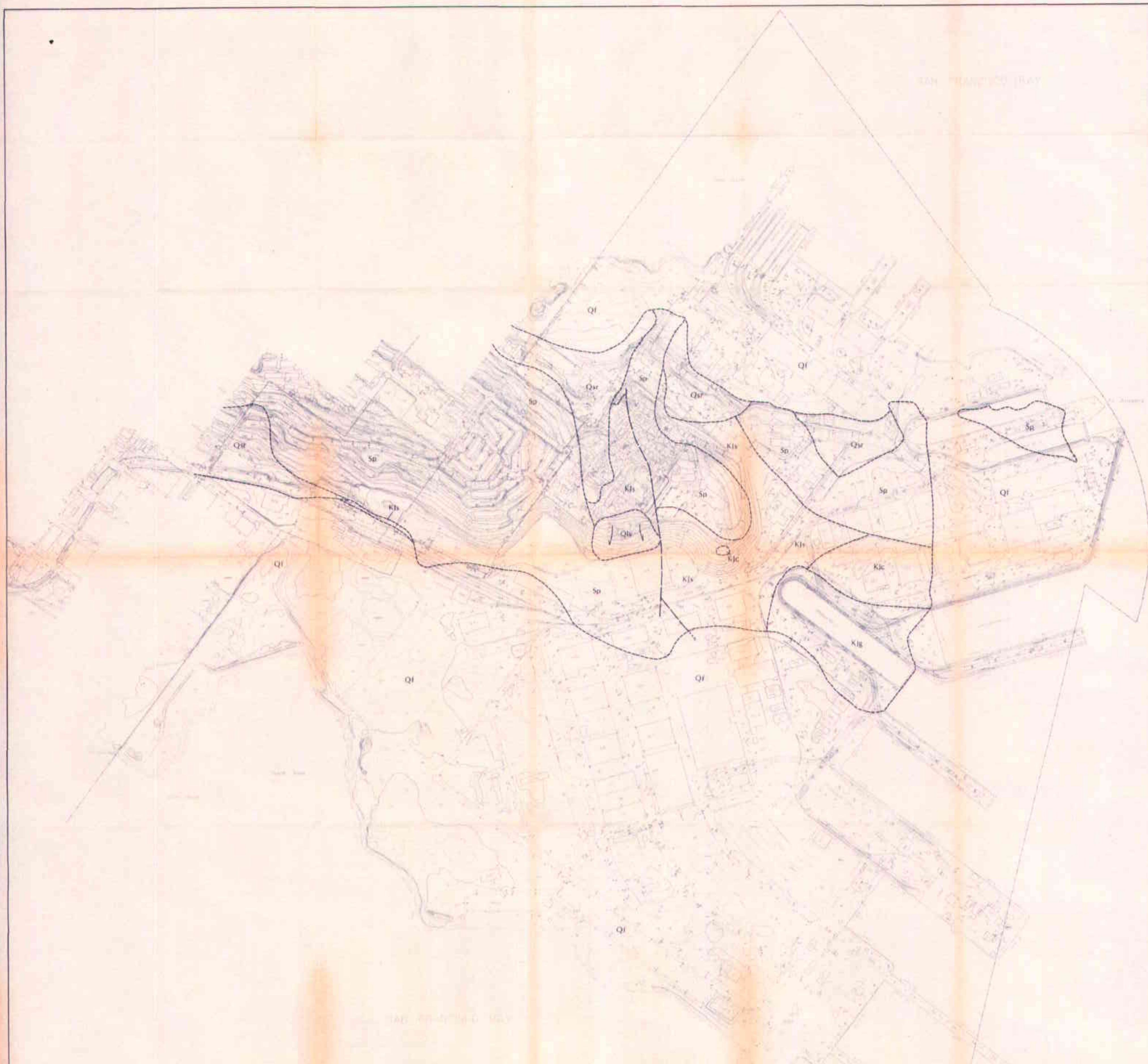


Harding Lawson Associates
Engineers, Geologists & Geophysicists

Site Characterization and Remediation Process Diagram
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE 3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
NJB	2176,121.02	SMF	11/87		



EXPLANATION TO GEOLOGIC MAP

SURFICIAL DEPOSITS

Qls	LANDSLIDE DEBRIS ZONE
Qf	FILL MATERIALS, INCLUDES MATERIALS FROM LOCAL CUT/FILL GRADING AND DISPOSAL OF REFUSE AND SANDBLAST WASTE
Qsr	SLOPE AND RAVINE - FILL DEPOSITS; MAY HAVE BEEN REMOVED IN SOME AREAS BY GRADING OPERATIONS

FRANCISCAN COMPLEX BEDROCK

KJs	SANDSTONE AND SHALE
KJc	CHERT, INTERBEDDED WITH SHALE
KJg	GREENSTONE (METAMORPHOSED VOLCANIC ROCK)
Sp	SERPENTINITE; CONTAINS SMALL BODIES OF UNSERPENTINIZED ULTRAMAFIC ROCK
	CONTACT BETWEEN GEOLOGIC UNITS (APPROXIMATE)
	INACTIVE FAULT (APPROXIMATELY LOCATED; DOTTED WHERE CONCEALED BENEATH YOUNGER DEPOSITS)

SCALE IN FEET

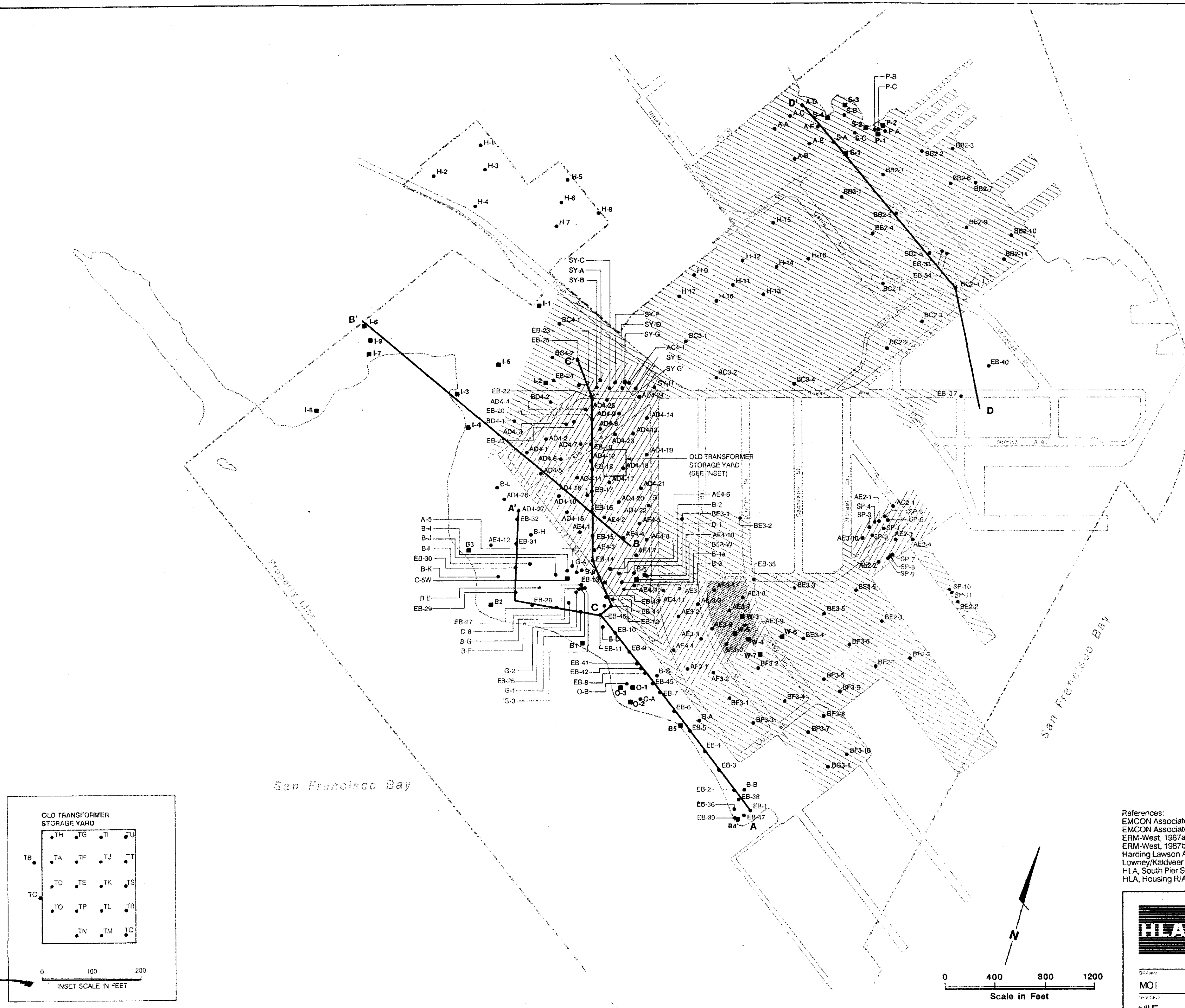
N

HLA **Harding Lawson Associates**
Engineers and Geoscientists

Topographic and Geologic Map
Scoping Document
Hunters Point Annex
San Francisco, California

4

ML | 2176,121.02 | 2/88



EXPLANATION

- Area Study A
- Area Study B
- PCB Study Area
- A——A' Cross-Section Line
- Boring
- Monitoring Well

References:
EMCON Associates, 1987a, Confirmation Study, Verification Step
EMCON Associates, 1987b, Area Study for Asbestos-Containing Material and Organic and Inorganic Soil Contamination
ERM-West, 1987a, Hunters Point Naval Shipyard, Soil Water Sampling near Proposed Galley
ERM-West, 1987b, Investigation of PCBs in Soil and Groundwater at the Hunters Point Site
Harding Lawson Associates (HLA), 1987, Subsurface Investigation, Proposed Galley
Lowney/Kaldveer Associates, 1972, Foundation Investigation
HLA, South Pier Study, in Progress
HLA, Housing R/A, in Progress

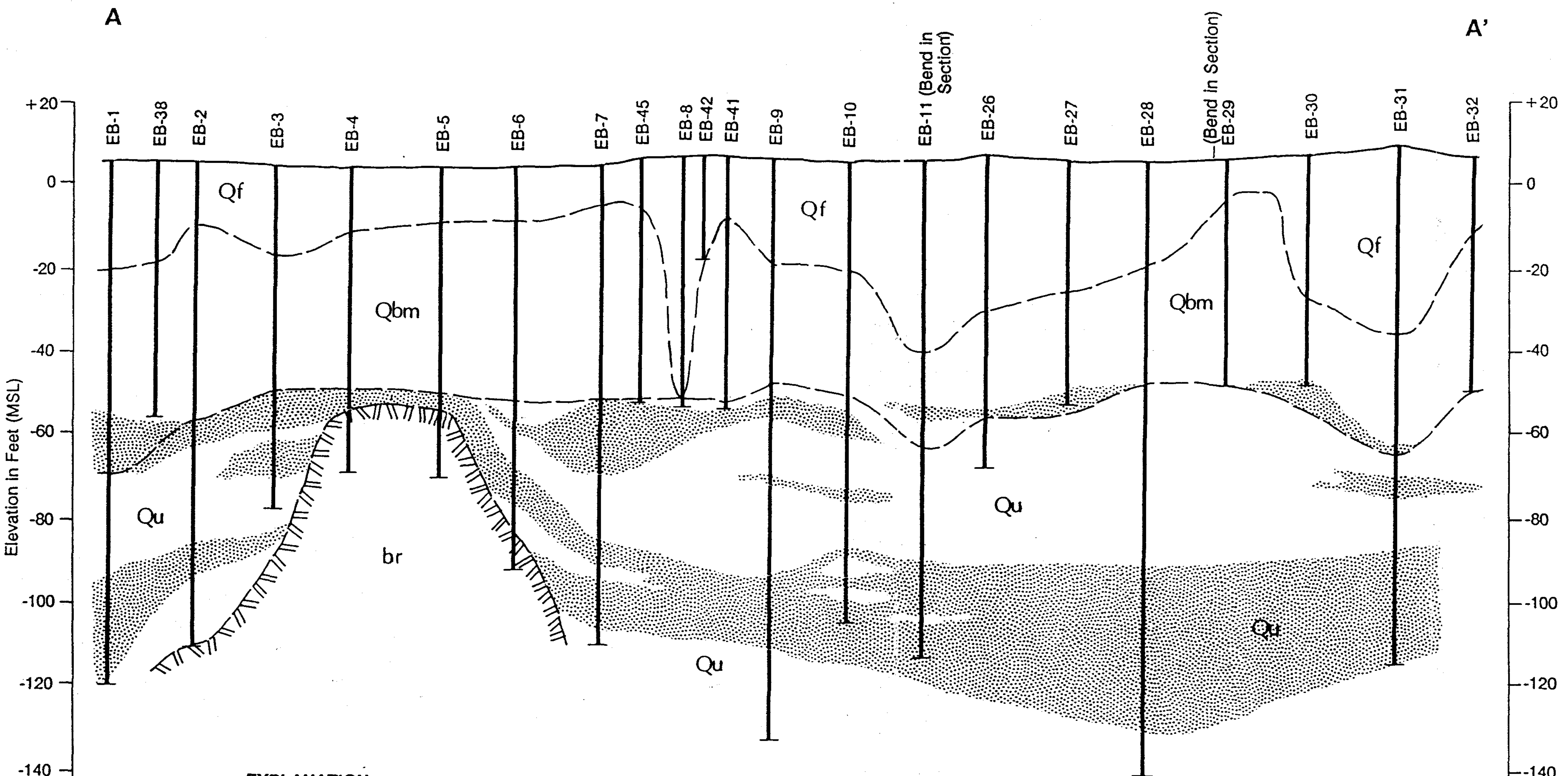
Harding Lawson Associates
Engineers, Geologists & Geophysicists

Boring and Well Location Map
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE 5

DRAWN	JOB NUMBER	APPROVED	DATE
MOI	02178,121.02	SMF	11/87
REVISED	DATE	REVISED	DATE
SMF	2/88		

2984



EXPLANATION

Qf — Man-placed fill; sand, gravel, silt and clay

Qbm — Bay Mud Deposits; soft, saturated clays and silts, with interbedded loose sand

Qu — Undifferentiated Sedimentary Deposits; consolidated sandy clay, sand and clayey sand (may be correlative with Colma Formation)

br — Bedrock, primarily highly fractured and sheared serpentinite with lesser greenstone, sandstone and chert (Franciscan Complex)

Lithology within Qbm and Qu units:

Sand and Clayey/Silty Sand, with occasional gravel

Clay and Sandy Clay

EB-10 (10',N) — Distance (in feet) and direction of boring from cross-section line

Boring or well log used to generate cross-section

Test boring

Inferred contact between geologic units

Well or Boring Name	Source of Information
EB Borings	Lowney-Kaldveer Associates (1972)

Interpretation of subsurface conditions is based on test boring data from this study and has not been confirmed by HLA. The cross sections represent one interpretation of the data and may be revised as new data are obtained.

0 300 600

Horizontal Scale in Feet

Vertical Exaggeration = 10X

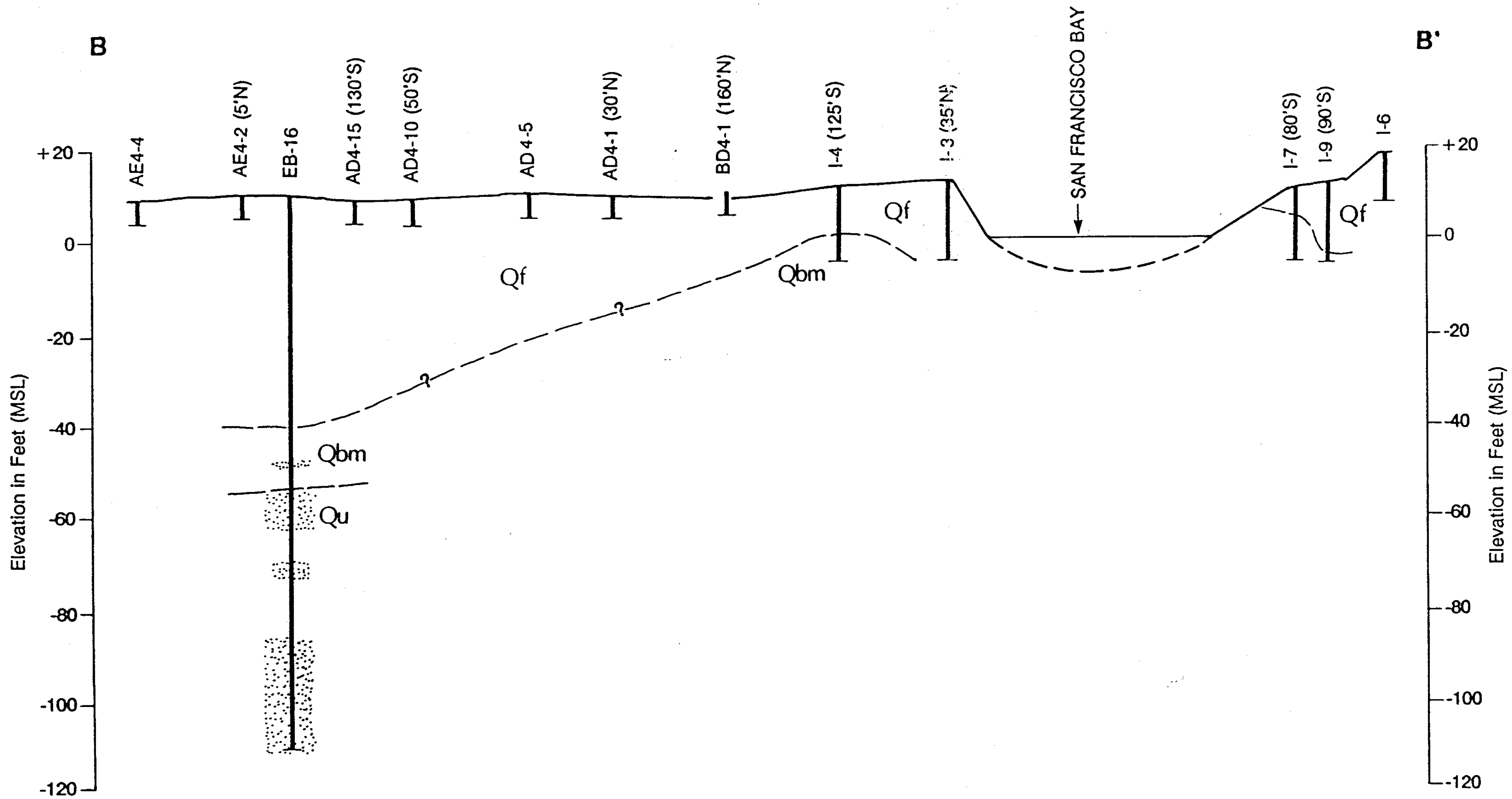
Harding Lawson Associates
Engineers, Geologists & Geophysicists

Geologic Cross-Section A-A'
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE **6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2176,121.02	SMF	11/87		2/88

3031



EXPLANATION

Qf — Man-placed fill; sand, gravel, silt and clay

Qbm — Bay Mud Deposits; soft, saturated clays and silts, with interbedded loose sand

Qu — Undifferentiated Sedimentary Deposits; consolidated sandy clay, sand and clayey sand (may be correlative with Colma Formation)

br — Bedrock, primarily highly fractured and sheared serpentinite with lesser greenstone, sandstone and chert (Franciscan Complex)

Lithology within Qbm and Qu units:

Sand and Clayey/Silty Sand, with occasional gravel

Clay and Sandy Clay

I-3 (35'N) — Distance (in feet) and direction of boring from cross-section line

Boring or well log used to generate cross-section

Test boring

? — Inferred contact between geologic units, queried where uncertain

0 300 600

Horizontal Scale in Feet

Vertical Exaggeration = 10X

Well or Boring Name	Source of Information
AD4-1	EMCON (1987b) Volume II, Appendix C
AD4-5	EMCON (1987b) Volume II, Appendix C
AD4-10	EMCON (1987b) Volume II, Appendix C
AD4-15	EMCON (1987b) Volume II, Appendix C
AE4-2	EMCON (1987b) Volume II, Appendix C
AE4-4	EMCON (1987b) Volume II, Appendix C
BD4-1	EMCON (1987b) Volume II, Appendix C
EB-16	Lowney-Kaldveer Associates (1972)
I-3	EMCON (1987a) Volume II
I-4	EMCON (1987a) Volume II
I-6	EMCON (1987a) Volume II
I-7	EMCON (1987a) Volume II
I-9	EMCON (1987a) Volume II

Interpretation of subsurface conditions is based on test boring data from these studies and has not been confirmed by HLA. The cross sections represent one interpretation of the data and may be revised as new data are obtained.

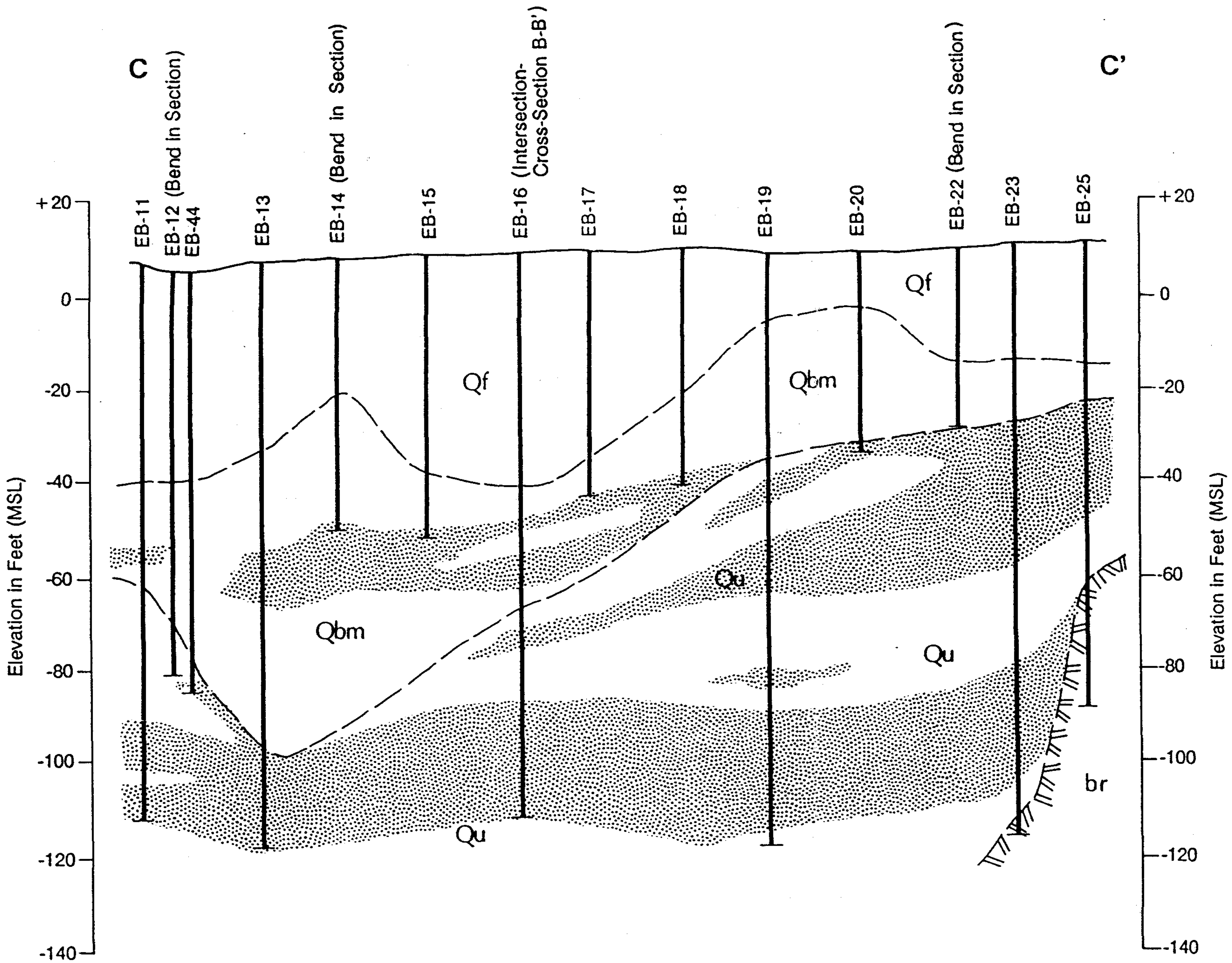
Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Geologic Cross-Section B-B'
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE **7**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2176,121.02	SMF	11/87		2/88

3032



EXPLANATION

Qf Man-placed fill; sand, gravel, silt and clay

Qbm Bay Mud Deposits; soft, saturated clays and silts, with interbedded loose sand

Qu Undifferentiated Sedimentary Deposits; consolidated sandy clay, sand and clayey sand (may be correlative with Colma Formation)

br Bedrock, primarily highly fractured and sheared serpentinite with lesser greenstone, sandstone and chert (Franciscan Complex)

Lithology within Qbm and Qu units:

Sand and Clayey/Silty Sand, with occasional gravel

Clay and Sandy Clay

(35',N) Distance (in feet) and direction of boring from cross-section line

EB-15 Boring or well log used to generate cross-section

Test boring

Inferred contact between geologic units

0 300 600

Horizontal Scale in Feet

Vertical Exaggeration = 10X

Well or Boring Name	Source of Information
EB Borings	Lowney-Kaldveer Associates (1972)

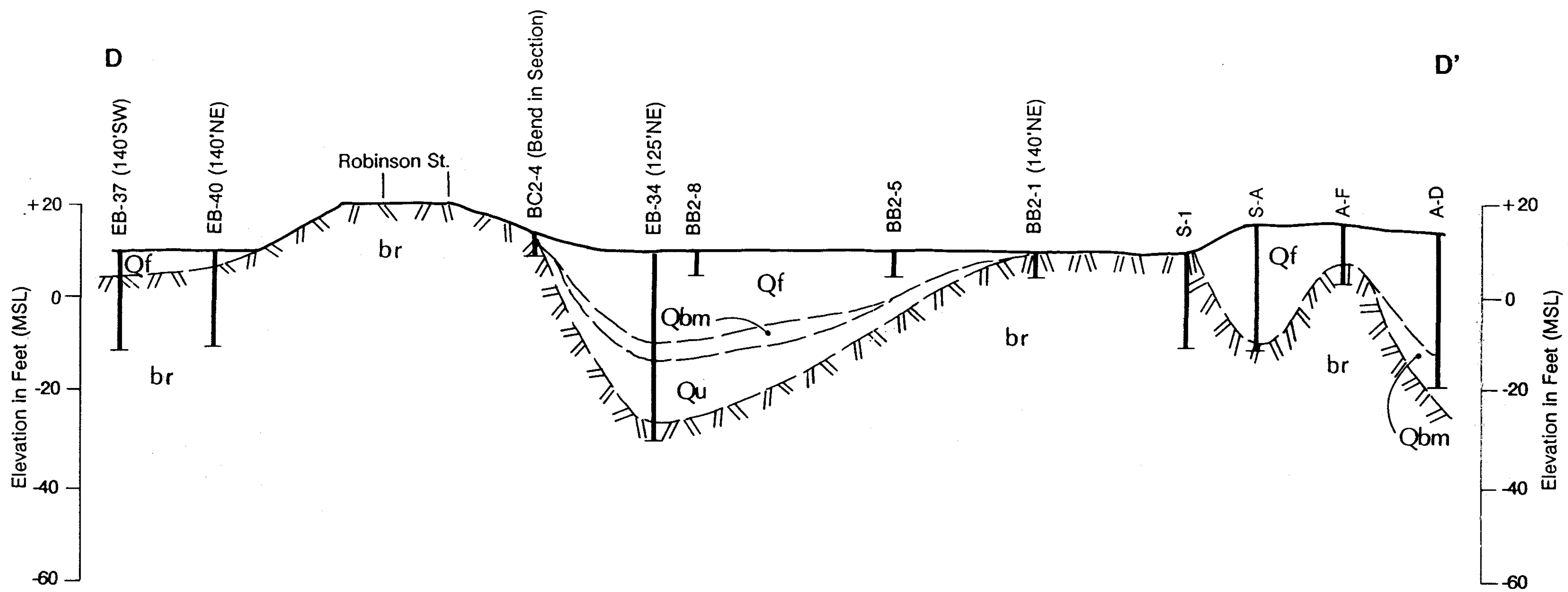
Interpretation of subsurface conditions is based on test boring data from this study and has not been confirmed by HLA. The cross sections represent one interpretation of the data and may be revised as new data are obtained.

HLA **Harding Lawson Associates**
Engineers, Geologists
& Geophysicists

Geologic Cross-Section C-C'
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE **8**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2176,121.02	SMF	11/87		2/88



EXPLANATION

Qf — Man-placed fill; sand, gravel, silt and clay

Qbm — Bay Mud Deposits; soft, saturated clays and silts, with interbedded loose sand

Qu — Undifferentiated Sedimentary Deposits; consolidated sandy clay, sand and clayey sand (may be correlative with Colma Formation)

br — Bedrock, primarily highly fractured and sheared serpentinite with lesser greenstone, sandstone and chert (Franciscan Complex)

Lithology within Qbm and Qu units:

Sand and Clayey/Silty Sand, with occasional gravel

Clay and Sandy Clay

EB-34 (10'NE) — Distance (in feet) and direction of boring from cross-section line

— Boring or well log used to generate cross-section

— Test boring

— Inferred contact between geologic units

Well or Boring Name	Source of Information
A-D	EMCON (1987a) Volume II
A-F	EMCON (1987a) Volume II
BB2-1	EMCON (1987b) Volume II, Appendix C
BB2-5	EMCON (1987b) Volume II, Appendix C
BB2-8	EMCON (1987b) Volume II, Appendix C
BC2-4	EMCON (1987b) Volume II, Appendix C
EB-34	Lowney-Kaldveer Associates (1972)
EB-37	Lowney-Kaldveer Associates (1972)
EB-40	Lowney-Kaldveer Associates (1972)
S-A	EMCON (1987a) Volume II
S-1	EMCON (1987a) Volume II

Interpretation of subsurface conditions is based on test boring data from these studies and has not been confirmed by HLA. The cross sections represent one interpretation of the data and may be revised as new data are obtained.

0 300 600

Horizontal Scale in Feet

Vertical Exaggeration = 10X

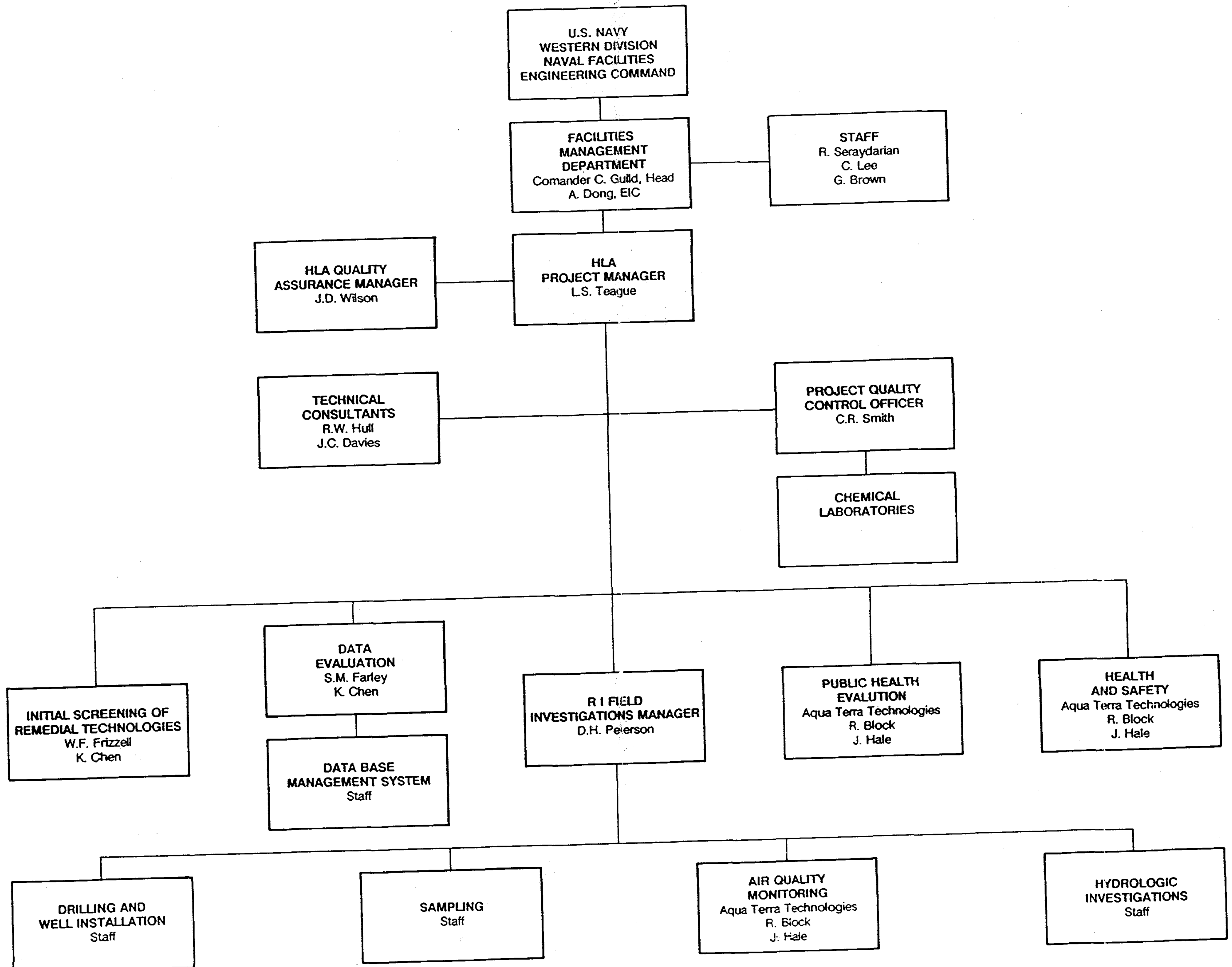
Harding Lawson Associates
Engineers, Geologists & Geophysicists

Geologic Cross-Section D-D'
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE 9

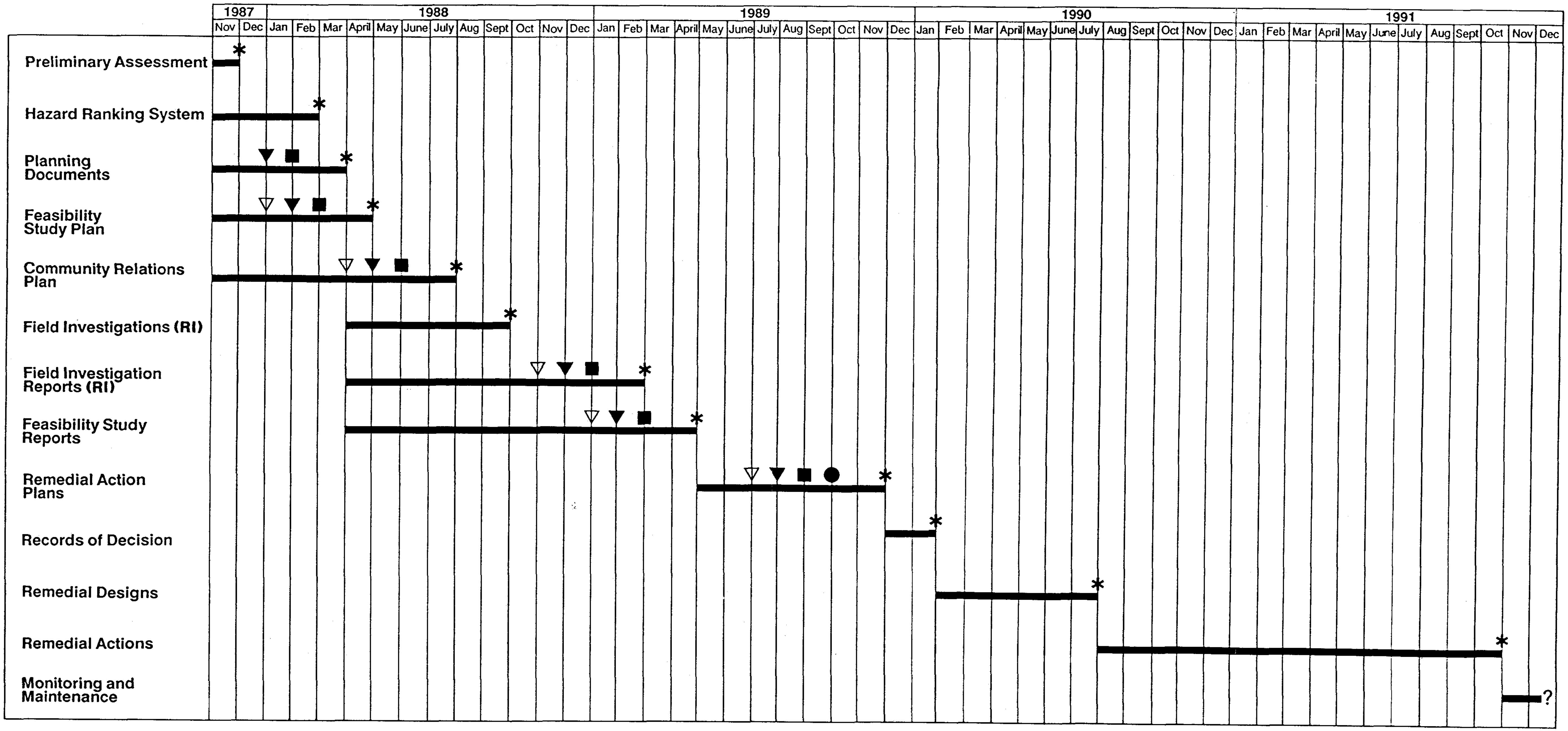
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	2176,121.02	SMF	11/87		2/88

3033



HLA Harding Lawson Associates Engineers and Geoscientists		Project Organization Chart Scoping Document Hunters Point Annex San Francisco, California		PLATE 10
DRAWN ML	JOB NUMBER 2176,121.02	APPROVED SMF	DATE 11/87	REVISED / DATE

109463



▽ Submit Draft to Navy

▼ Submit Draft to Regulatory Agencies

■ Receive Comments form Regulatory Agencies

✱ Submit Final To Regulatory Agencies or Task Complete

● Receive Public Comments/Public Meeting

Harding Lawson Associates
Engineers, Geologists
& Geophysicists

Preliminary Project Schedule
Scoping Document
Hunters Point Annex
San Francisco, California

PLATE **11**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
EH	2176,121.02	SMF	11/87		

Harding Lawson Associates

DISTRIBUTION
SCOPING DOCUMENT
HUNTERS POINT NAVAL SHIPYARD
SAN FRANCISCO, CALIFORNIA

May 19, 1988

COPY NO. ___

		Copy No.
16 copies:	Western Division Naval Facilities and Engineering Command P.O. Box 727 San Bruno, California 94066-0720 Attention: Mr. Alex Dong (Code 1146)	1 - 16
1 copy:	Job File Copy	17
1 copy:	QC Bound Report	18
5 copies:	Harding Lawson Associates	19 - 23
1 copy:	Aqua Terra Technologies	24

LST/JCD/DHP/SMF/ljc/C1031-R

QUALITY CONTROL REVIEWER

James C. Davies

James C. Davies
Principal Engineer